MODERN
Machine Shop
March, 1950

Why Operators Like Cimcool

This revolutionary cutting fluid is tops with metal cutting operators because Cimcool° makes jobs better. And no wonder! Cimcool is superior to old-fashioned coolants because it is a *chemical emulsion* incorporating a radically new and different principle in cutting fluids.

Operators say Cimcool is the biggest working improvement in years because "it's clean . . . doesn't soil hands or clothing . . . can't smoke . . . can't burn . . . virtually eliminates rancidity and foul odors . . . leaves no hazardous slippery film on hands, machine, work or floor . . . contains no skin irritants . . . and cools so fast that tools and chips actually stay cool to the touch."

You'll get better production when you make jobs better with Cimcool. Let a demonstration in one of your own machines convince you. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you. Or if you prefer, send for our free booklet "CIMCOOL Gives the Answers." Address, Sales Manager, CIMCOOL Division, The Cincinnati Milling Machine Company, Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

for 85%
OF ALL METAL CUTTING JOBS

fifty per cent cooler

for better accuracy—higher precision!

Accuracy-destroying heat has been left out in the cold. Not only in the design of the new Heald Red-Head boringheads and wheelheads, but in every other element of the Heald machines as well.

That, in part, is Heald's answer to today's urgent need for higher precision, greater accuracy, and faster, lower-cost production.

Remember — when it comes to precision finishing, it pays to come to Heald.

Heald Red-Head boringheads and wheelheads run 50% cooler than oil-lubricated heads. What's more, they're lubricated for life—and the extra-rigid spindles are mounted in super-precision bearings with labyrinth seals. These Heald features mean longer, smooth-running operation—less maintenance—higher accuracy and precision.

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

HEALD

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

VOLUME 22 NUMBER 10
MARCH, 1950

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MODERN Machine Shop

Contents

Features in This Issue 69

Aircraft Accessory Production Demands Ultra-Precision . . 70
By Gilbert C. Close

Maintaining Mechanical Equipment 92
By Sigurd K. Rudorf

Machining Parts for Fireball Engines 110
By Herbert Chase

Analyzing Blank and Scrap Strip Developments 126
By C. W. Hinman

Sales Hints for the Smaller Shop 144
By Karl F. Kirchhofer

Geiger Counter Employed in Steel Analysis Method 156

A Practical Guide to Steel Selection 166
By Norman N. Brown

Modern Equipment at Work

—Production Rate for Bending Operation Increased 2½ Times 206

—Tiny Fuel Tank Leaks Discovered with Electronic Leak Detector 207

—Scrapers Improved by Using Cemented Carbide Tips 210

—Welding Booth Has Sides of Cloth Panels 212

—Automatic Lubrication of Punching Tools Increases Metal Sash Production 216

Ideas from Readers

—Centering Device for Telescopic Gages 218
By Charles Beresford

—Tinning of Aluminum 219
By W. E. Warner

—A Handy Tool for Wire Bending 221
By B. A. Lee

—Ingenious Method for Milling Special Threads 222
By Edward Diskavich

—Dial Test Indicator Attachments 225
By Daniel E. McDonald

—Automobile Transmission Used in Driving Lathe 226
By Elton Sterrett

News of the Industry 228

The Challenge of Science and Technology to Management 248
By L. A. DuBridge

New Shop Equipment 270

Services Directory 306

"Where to Get It" 308

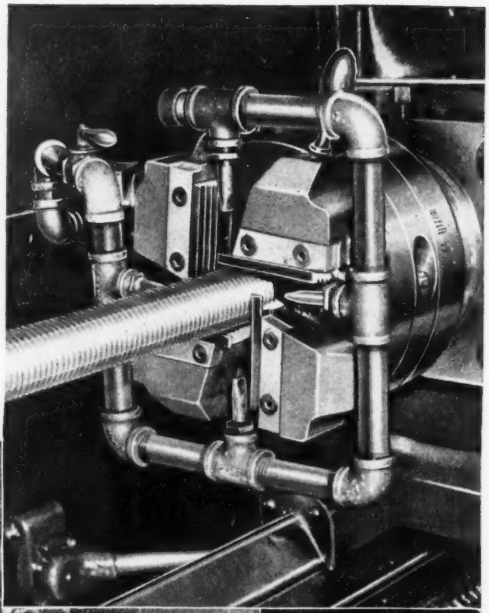
Over the Editor's Desk 314

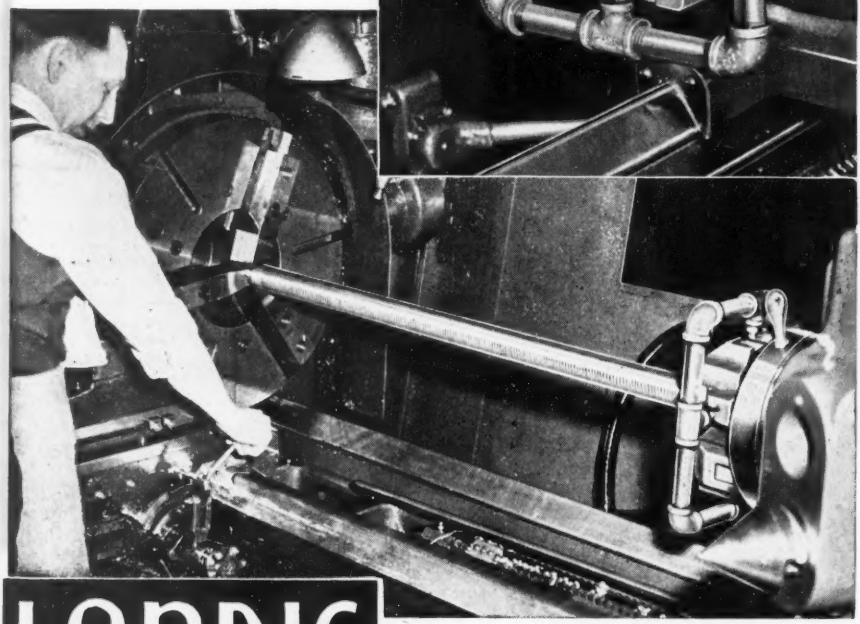
There's One in Every Shop 316

Index to Advertisements 318

LANDMATIC HEADS...for TURRET LATHE Threading Operations

"Only one cut is taken in forming the thread from the blank tube. This results in a tremendous saving in time over the former practice of chasing and grinding the threads, grinding being no longer necessary because of the accurate performance of the die head chasers," writes the manufacturer.





LANDIS MACHINE COMPANY
WAYNESBORO, PA., U.S.A.

Illustrations show a 3" LANDMATIC Die Head used by a Western aircraft company to thread long Wing-Flap Retracting Screws to extremely close tolerances. An Acme thread of 2" diameter, 4 threads per inch, is being cut to a length of 45½" on heat treated alloy steel tube 48" in length.

Write for Bulletins F-80 and F-90

CUT DIAMOND AND PRODUCTION COSTS 50%

with the NEW CITCO HYDRAULIC Automatic—Adjustable DIAMOND TURNER

TURNS DIAMOND
ADJUSTABLE — to three ranges of degrees. Once set, turns diamond automatically as shown.
3½° FOR FINISHING
7° SEMI-FINISHING
10½° ROUGHING
Segments are split automatically at completion of turning cycle, as shown.

Saves your DIAMOND DOLLARS!

A NEW ERA IN DIAMOND DRESSING!

Operates automatically! Adjustable to three ranges of degrees!

The CITCO hydraulic Diamond Turner turns and holds the diamond rigidly by hydraulic means —generates on the diamond, a definite and consistent sharp edge every 3½, 7 or 10½ degrees in any one of the three ranges, eliminating exposure of flat surface to grinding wheel.

Not a gadget, not an attachment, the CITCO hydraulic automatic and adjustable Diamond Turner when installed, becomes a rigid and permanent part of your centerless grinder. All moving parts are sealed in oil — no exposure to outside elements. Unconditionally guaranteed for one year. Investigate! Write, phone or wire today for full particulars.

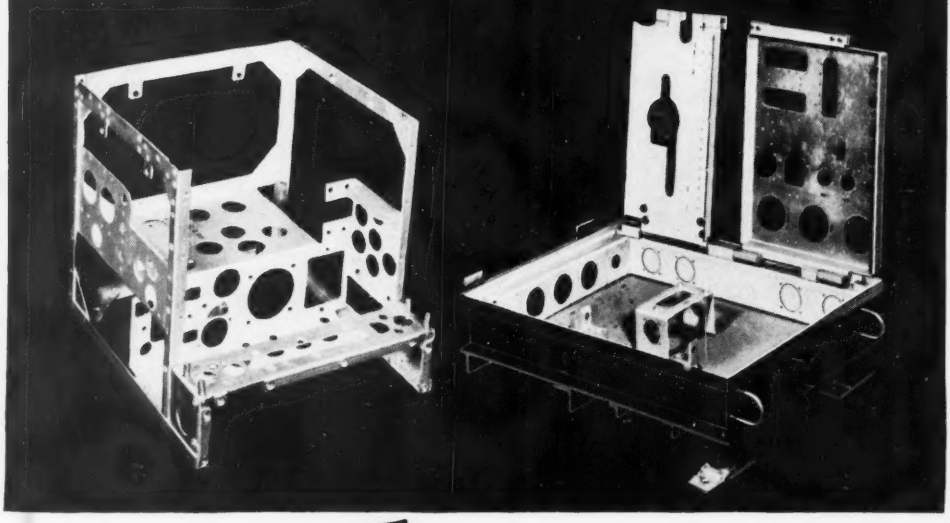
CITCO

"Saves your Diamond Dollars"

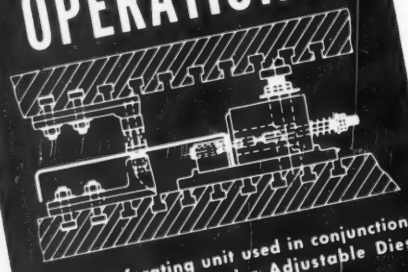
Cleveland Industrial Tool Corp.
1080 East 222nd St., • Cleveland 17, Ohio

Manufacturers of Citco Solid Copper Diamond Tools . . . They're cool.

WHISTLER ADJUSTABLE DIES...USED BY OVER 1000 MANUFACTURERS



SIMPLIFYING COMPLICATED PIERCING OPERATIONS...



HU-50 Perforating unit used in conjunction with standard Whistler Adjustable Dies on the same job.

LEADING manufacturers find it fast, simple, accurate, and economical to use Whistler Adjustable Dies for the tough jobs. Complicated patterns can be set up quickly. It's easy to change hole arrangements too . . . without waiting and at no extra die cost. New HU-50 units, that pierce at 90° angle, can be used in conjunction with standard perforating equipment. Fewer press operations are necessary.

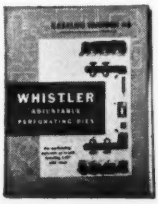
Savings, through continued re-use of the same dies in different arrangements on many jobs, are most important.

Whistler Adjustable Dies can be used in practically every type press. Standard sizes of punches and dies up to 3″ are available in a hurry. Only a few days are necessary to get special shapes made to order.

S. B. WHISTLER & SONS, INC.

740 Military Road Buffalo 17, N. Y.

First Public Showing of Whistler Magnetic Dies at Work—Booth 832, ASTE Convention, April 10-14, Philadelphia.



For more details **on this modern way to speed production and save money, write for your copy of the Whistler catalog.**

QUIET

PRECISION AT WORK

Quiet operation is one of the outstanding characteristics of the *Gear with a Backbone*. Accuracy of tooth contour and tooth spacing, so vital to smooth operation, is inherent in the famous Farrel-Sykes method by which the teeth of this gear are generated.

Then too, because of the continuous tooth design, a maximum number of teeth are always in mesh. Overlap or interlacing of teeth, together with gradual engagement, are characteristics which promote smooth, quiet operation. Oblique lines of contact and evenly distributed pressure eliminate danger of noise resulting at some later date from uneven tooth wear.

These "silent partners" of industry are available in any size up to 20 feet in diameter, for practically any application. Information and engineering assistance available, without obligation.

Farrel-Birmingham Co., Inc., 344 Vulcan St., Buffalo 7

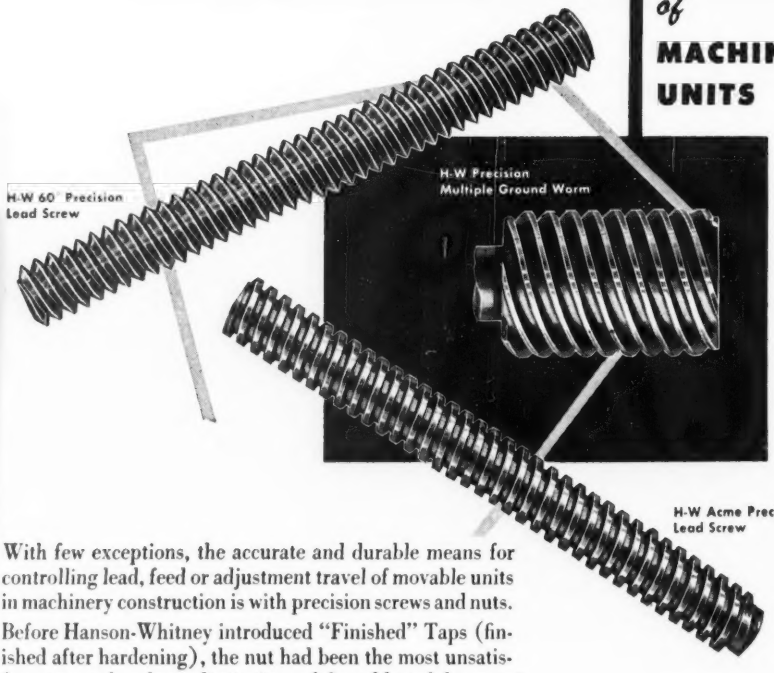
Plants: Ansonia and Derby, Conn., Buffalo, N.Y.

Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Detroit, Chicago, Los Angeles, Tulsa, Houston

Farrel-Birmingham

FB-531

For ACCURATE TRAVEL CONTROL *of* MACHINE UNITS



With few exceptions, the accurate and durable means for controlling lead, feed or adjustment travel of movable units in machinery construction is with precision screws and nuts.

Before Hanson-Whitney introduced "Finished" Taps (finished after hardening), the nut had been the most unsatisfactory member due to limitations of thread length because of defective taps. Now, with "Finished" Taps, accurate nuts are produced with sufficient thread length to meet any requirements.

Hanson-Whitney equipment has long produced hardened, precision screws and finished taps for properly proportioned nuts, with threads up to 8 inches in diameter and 24 inches thread length (or longer). We offer you this precision combination to meet your specifications, confident that no finer quality can be obtained. Estimates furnished on request.

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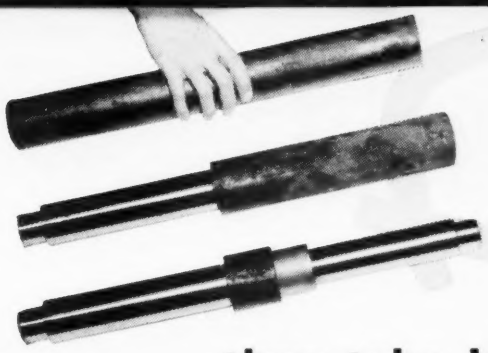
Valuable engineering, illustrated Catalog on request. Please use your business stationery.

Hanson Whitney

PIONEERS OF FINISHED TAPS

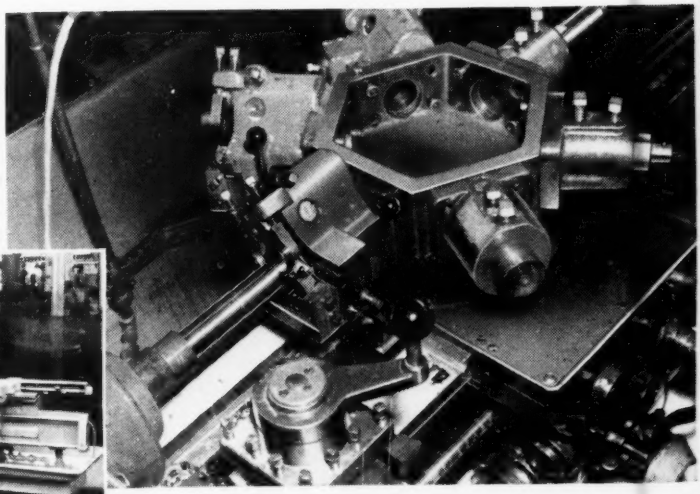
ZHW50

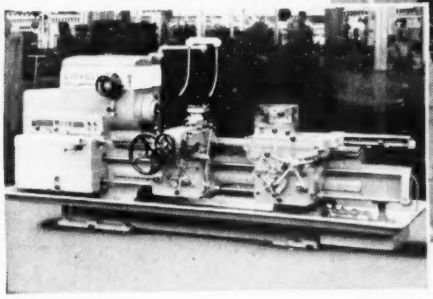


take shaft jobs Like This:

they take less time on
GISHOLT TURRET LATHES

Yes, even in lots as small as 5 or 10 parts, you can't beat turret lathes on this kind of work. Parts are machined complete in 2 operations—total time is less than 4 min.





no extra equipment needed!

With no more than your standard bar equipment, you're all set to cut machining costs on shafts like these. No previous operations . . . such as cutting to length or centering . . . are necessary. And with *two or more tools* from turret and side carriage, you have the basic advantage of turret lathe economy—the time saving that means lower costs.

Before you turn to extra equipment or special attachments, look into the possibilities of doing the job the quick and easy way on Gisholt Turret Lathes. Gisholt engineers will gladly help you.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

TURRET LATHES · AUTOMATIC LATHES
SUPERFINISHERS · BALANCERS
SPECIAL MACHINES

GISHOLT MACHINE COMPANY
MADISON 10, WISCONSIN

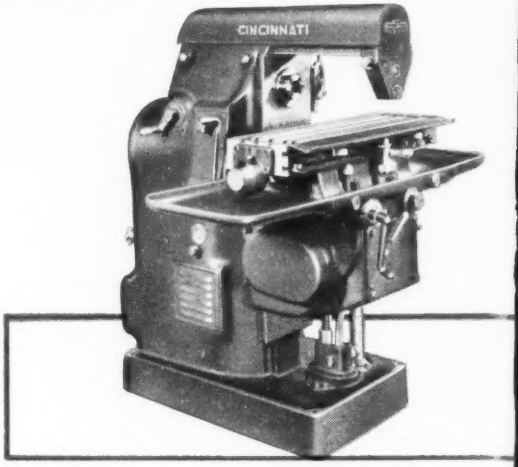
A Cost Reducing Combination

Cincinnati Automatic Milling AND Automatic Two-Spindle Fixture

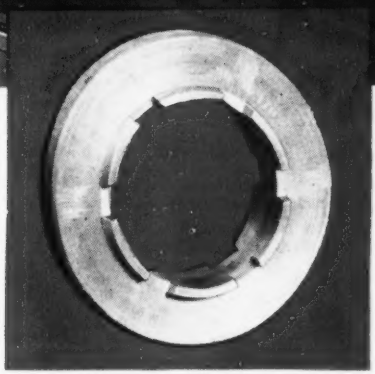
One style of sliding clutch, manufactured by a prominent eastern corporation, required six milled slots. To keep the cost of the operation in line with production, Cincinnati Application Engineers tooled up a CINCINNATI No. 1-12 Plain Automatic Milling Machine with a two-spindle automatic index fixture and suitable cutters, ready for production. The operator loads the fixture and trips the starting lever; then the automatic cycle takes over: advance, mill, retract, index and repeat for each slot. In addition to the obvious advantages of automatic indexing and milling two parts at one time, there are four advantages in this machine which are not apparent in the photograph.

1. Down-milling — a 1-12 standard feature
2. 300 in. per min. rapid traverse — a 1-12 standard feature
3. Dynapoise overarm — a 1-12 standard feature
4. Automatic spindle stop — a 1-12 standard feature

Many other standard features of value in performing 3 hp milling operations at low cost, on parts made in large or small quantities, are described in catalog M-1555. May we send a copy to you?



THE CINCINNATI



Part name... Sliding clutch

Material..... Steel

Operation... Mill six slots

Speed..... 82 feet per minute

Feed..... 9 inches per minute

Production... 38 per hour

Equipment... CINCINNATI No. 1-12 Plain Automatic Milling Machine, with tooling by Cincinnati

CINCINNATI No. 1-12 Plain Automatic Milling Machine. Complete information on all features and their benefits may be obtained by writing for catalog M-1555.

CINCINNATI

MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

ARMSTRONG

Quality TOOLS

NOT A COST . . .
BUT AN INVESTMENT
that pays year after year

Buy ARMSTRONG TOOL HOLDERS and TOOLS for today's job and they will bring you added profits thru the years. With ARMSTRONG TOOL HOLDERS you will be permanently tooled up for whatever comes, for each is a multi-purpose tool that takes cutter-bits ground to many shapes. Each is an efficient tool, refined thru a half century of world wide use. Each has strength beyond any need, extra strength resulting from endless research and the most modern closely controlled manufacturing methods.

ARMSTRONG TOOL HOLDERS are inexpensive too, for they are produced in great numbers. They are instantly available because they are carried in stock by all leading supply houses in sizes and types for every operation on lathes, planers, slotters and shapers; for standard operations on turret lathes and screw machines. They are profitable in use because they permit the highest speeds and heaviest feeds, and "Save: All Forging, 70% Grinding and 90% High Speed Steel."

ARMSTRONG Lathe and Milling Machine Dogs are permanent tools too. They are drop-forged from special open hearth steel, are heat treated to extreme stiffness and toughness. They have alloy steel screws hardened at the tip to prevent up-setting and have double life, for hubs are made oversize to permit re-tapping.

ARMSTRONG Quality pays back over and over again. Write for new S-48 catalog. It offers many opportunities to conserve profits

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5228 W. ARMSTRONG AVENUE • CHICAGO 30, ILL.

ROTARY MILLING & INDEXING ON ANY MILLING MACHINE

KNIGHT'S

20" ROTARY TABLE

A SINGLE-UNIT SELF-CONTAINED MOTOR-DRIVEN TIME & MONEY SAVER

- Eliminates all setup time—just plug it into electric outlet
- 18 Quick cutting feed changes from 1½" to 54" or 3" to 108"
- Knight's 20" Rotary Table has been used for many Special Applications including: Automatic Revolving Fixture . . . Automatic Indexing . . . Automatic Cycle Milling . . . Cam Milling . . . Special-Purpose Machines, etc.

Write us about your special problems

Return Coupon

FOR COMPLETE DETAILS

attach to company letterhead

W.B.KNIGHT
MACHINERY COMPANY

3920 WEST PINE BLVD.
ST. LOUIS 8, MISSOURI

W. B. KNIGHT MACHINERY CO., 3920 West Pine, St. Louis 8, Mo.

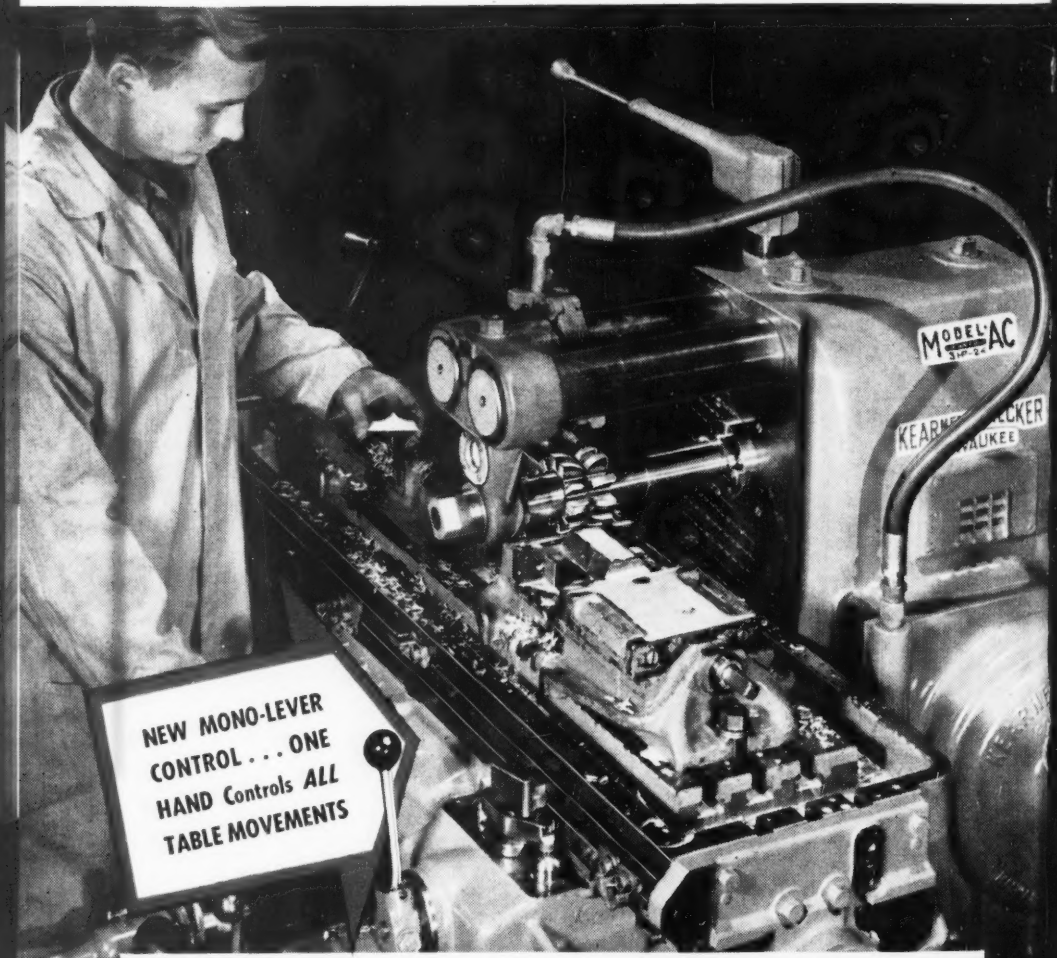
Send catalog page and price on the Knight 20" Rotary Table.

Name _____

Title _____

MORE GOODS for MORE PEOPLE at LOWER COST

Now in the 3hp range..FOUR NEW MACHINES FEATURING



Camera study of good management at work! The job — form mill two radii on medium steel wedge plates. Fine finish required. With new Kearney & Trecker 3 hp Model 24-AC machine, operator sets up automatic table cycle for reciprocal milling and easily paces production using climb and conventional milling alternately. RESULT: 28% savings in loading time, reduced scrap, more uniformity, less operator fatigue.

KNEE-TYPE MILLING MONO-LEVER CONTROL

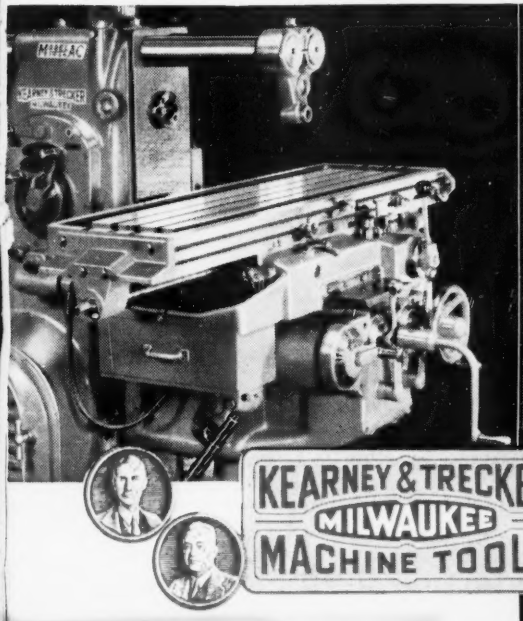
YOU asked for them — Kearney & Trecker milling machines in the 3 hp range with Mono-Lever Control and Automatic Table Cycle. Here they are — your choice of two different styles, plain or vertical with either 18″ or 24″ table feed.

These machines offer you features never before available on machines of this size and type: 33% larger table working area plus built-in deep-well coolant troughs all around — extra large (2″ dia.) precision-ground table screw with adjustable nut to eliminate backlash — drawer-type chip containers for easy chip removal — positive metered lubrication of the saddle and table ways and table feed mechanism — six-way power rapid traverse — automatic spindle stop — and quick-change feed and speed selection.

Don't wait. It costs you nothing to find out today about these new machines. See how they can meet all around big or small job requirements in your shop. For detailed information call our nearest representative or write direct to Kearney & Trecker Corporation, 6784 West National Ave., Milwaukee 14, Wis.

You get 33% more table working area on these new machines — 38″ x 14″ on Model 18-AC and 44″ x 14″ on Model 24-AC. This means greater adaptability to handle more jobs.

New 3 hp Model 24-AC plain style Kearney & Trecker milling machine featuring Mono-Lever Control and Automatic Table Cycle . . . ask about it or the vertical style equivalent today!



Here's how

JEFFREY

Manufacturing Company's Canadian Plant

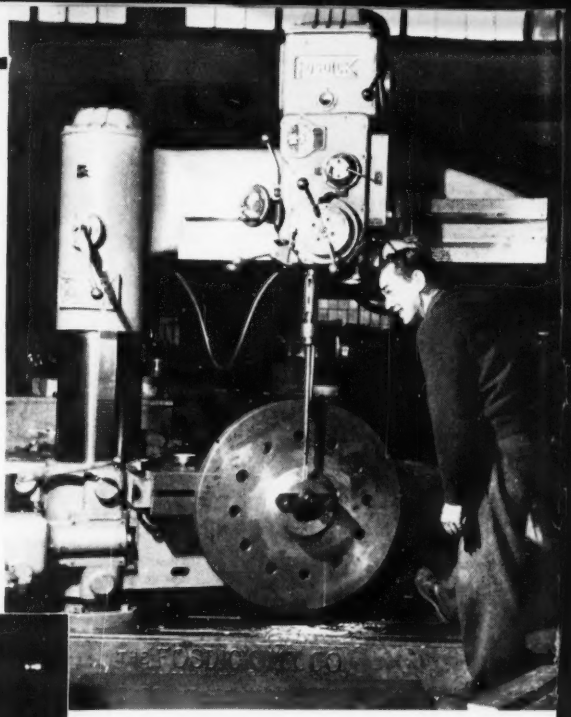
takes advantage of

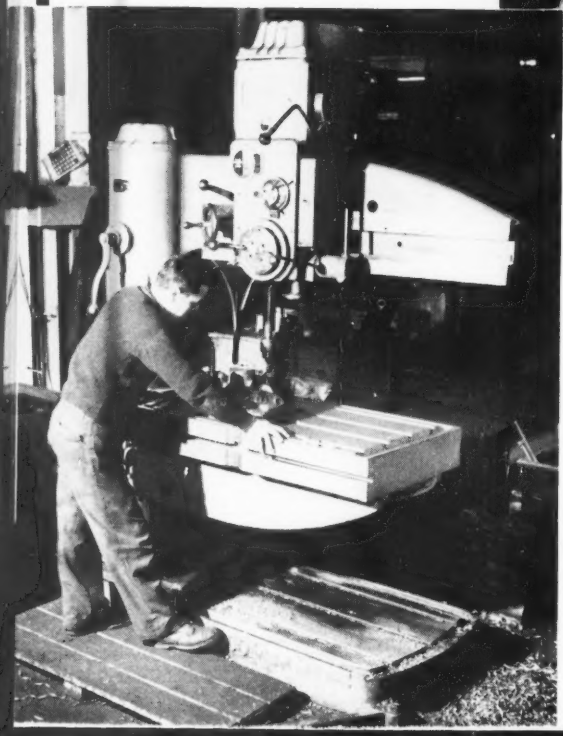
FOSDICK

Sensitive

RADIALS

Utility





● The job above illustrates the use of the horizontal slot along the side of the table for holding the large circular casting in position for tapping hole in hub.

The view at the left shows the work being drilled mounted in a jig on the adjustable table.

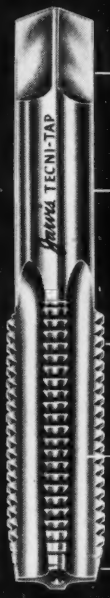
The two jobs indicate clearly the versatility of the machine for handling a wide variety of sensitive drilling, reaming, tapping and similar operations.

If you are looking for all around utility on your sensitive drilling operations, you should investigate the Fosdick Sensitive Radial.

For full particulars on the design—construction—and operation of this time and labor saving machine, ask for the new Fosdick Sensitive Radial Bulletin, S.R.M.M.S.

FOSDICK MACHINE TOOL CO.
CINCINNATI 23, OHIO

CUSTOM MADE at NO EXTRA CHARGE



ACCURATE SQUARES

CONCENTRIC SHANKS

UNIFORM FLUTE SPACING

CONTROLLED HOOK

PRECISION GROUND CHAMFER

Jarvis TECNI-TAPS

You pay nothing extra for having Jarvis Tecni-Taps custom made. Depth and width of flutes, hardness, hook, proper chamfer and other vital factors are carefully determined by qualified Jarvis personnel. The result — a ground-from-the-solid Tecni-Tap that gives you the maximum in accurate, long-lived, trouble-free service.

Call in the Jarvis factory-trained service engineer. He will gladly help you with your tapping requirements — show you how Jarvis custom-made Tecni-Taps can save you money and increase productivity.

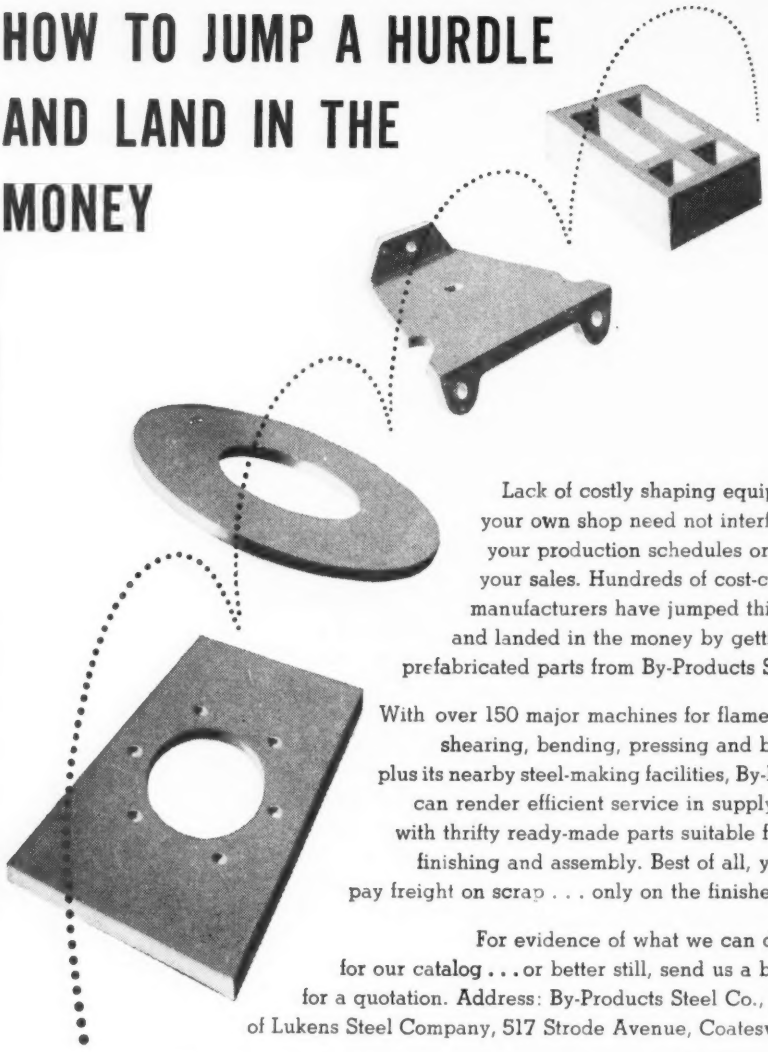
For additional literature, write: The Charles L. Jarvis Co., Middletown, Connecticut.

Jarvis POWER TOOLS

TAPPING ATTACHMENTS • TECNI-TAPS and DIES • ROTARY FILES
FLEXIBLE SHAFTS and MACHINES • QUICK CHANGE CHUCKS and COLLETS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

HOW TO JUMP A HURDLE AND LAND IN THE MONEY



Lack of costly shaping equipment in your own shop need not interfere with your production schedules or cut into your sales. Hundreds of cost-conscious manufacturers have jumped this hurdle and landed in the money by getting their prefabricated parts from By-Products Steel Co.

With over 150 major machines for flame cutting, shearing, bending, pressing and blanking, plus its nearby steel-making facilities, By-Products can render efficient service in supplying you with thrifty ready-made parts suitable for quick finishing and assembly. Best of all, you don't pay freight on scrap . . . only on the finished piece.

For evidence of what we can do, write for our catalog . . . or better still, send us a blueprint for a quotation. Address: By-Products Steel Co., Division of Lukens Steel Company, 517 Strode Avenue, Coatesville, Pa.

Plate that's shaped to save you money

BY-PRODUCTS STEEL CO.

A DIVISION OF LUKENS STEEL COMPANY

LUKENS

A-6597

Rotor's 15 New "Multi-power" Chippers are easier to handle . . . do jobs faster

● The unique hollow piston and "doughnut" valve of the 15 new Rotor "Multi-power" Chipping Hammers provide the 1-2 punch to cut your chipping costs.

Lighter Weight. These new Rotor Chippers average 1½ to 2 lbs. lighter than other chippers making them easier to handle.

Shorter. Exclusive "doughnut" valve makes possible saving of 1″ to 2″ in length, making it easier to get into those tough, crowded corners.

Faster Cutting. You get more blows per minute . . . because of new exclusive design.

3 Models In 1. By a simple change of parts you can adapt each of the 5 basic models to serve as 3 hammers to match your job: (1) A "regular" model, (2) A "super-speed" model, (3) A "super-sock" model.

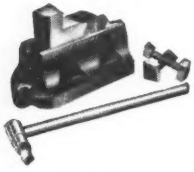
This is the biggest advancement in chipping hammers in the past 15 years! Find out all about it! Write for catalogue No. 37.

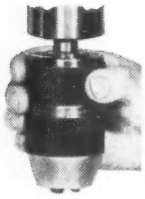
AIR O'TOOL

THE ROTOR TOOL CO.

CLEVELAND, OHIO

Precision MAKES THE DIFFERENCE





In Chuck Performance Too, precision makes the difference. And to hold peak precision, Horton engineers have developed, as an optional feature, **Flame Hardened Jaw Ways** in the body of its new "S" line of lathe chucks. Flame Hardening at the chuck's most vulnerable wear point assures more accurate chuck life than ever before possible. To gain more precision, all Horton Chucks undergo five exacting inspections during assembly; only the finest alloy steels are used; threads are machined after carburizing and all parts are properly heat-treated. This careful attention to every detail of manufacture at Horton means extra years of accurate and dependable chuck performance for you.

See your local distributor or write today for the new Horton Engineering Catalog.

See us at the A.S.T.E. Tool Show in Philadelphia, Booth 406

The E. HORTON & SON Co.

WINDSOR LOCKS • CONNECTICUT

HORTON Since 1851 CHUCKS

Enthusiastic Customers do our BEST advertising

Standard Pressed Steel Co., Jenkintown, Pa., use No. 25 Grand Rapids Hydraulic Feed Surface Grinders in making the tools and dies that produce Unbrako *Socket Screw Products,* Flexloc *Self-Locking Nuts and* Hallowell *Shop Equipment.*

You will appreciate the micro-inch finish produced at production speeds on Grand Rapids Grinders. All Grand Rapids Hydraulic Feed Surface Grinders have these outstanding features:

1. **One-piece column and base casting for vibrationless rigidity**
2. **Precision ball-bearing spindle which is greased for life**
3. **Bijur one-shot lubrication system eliminating hand oiling**
4. **Patented vertical movement of wheel head for quick, accurate adjustments**
5. **Portable coolant tank for ease of coolant replacement**
6. **Vane type hydraulic pump for fast longitudinal table travel**

to serve you—

Your inquiry concerning your specific grinding needs will receive prompt attention. Grand Rapids Grinders include: Hydraulic Feed Surface Grinders, Universal Cutter and Tool Grinders, Hand Feed Surface Grinders, Drill Grinders, Tap Grinders, and Combination Tap and Drill Grinders.

GRAND RAPIDS GRINDERS

GALLMEYER & LIVINGSTON COMPANY

308 Straight, S. W., Grand Rapids 4, Mich.

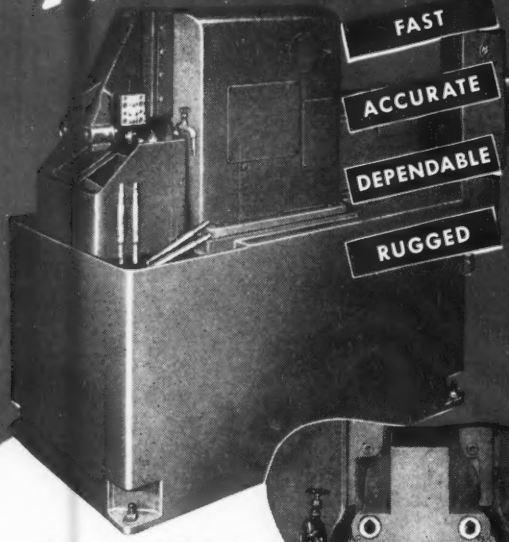
The New Motch & Merryweather Automatic

FAST

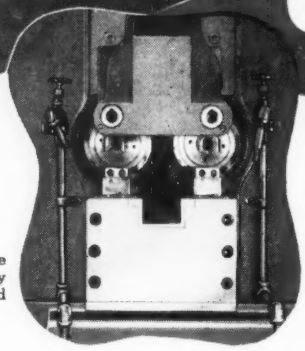
ACCURATE

DEPENDABLE

RUGGED

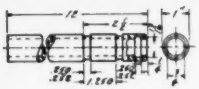


The new M. & M. Automatic is available as a bar-feed or hopper-loaded machine.



Illustrated at right are spindles and heavy duty forming slides with guard removed.

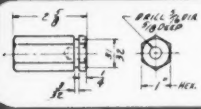
STUDY THESE TYPICAL JOBS



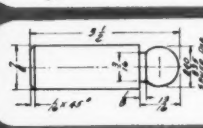
Operation: Form grooves, chamfer O. D., face and form internal groove.
Material: Seamless tubing—mild steel ⅛" wall.
Production: 1100 pcs/hr. @ 100% eff.

Operation: Form snap ring grooves, grease groove, chamfer and drill.
Material: AISI-1015.
Production: 720 pcs/hr. @ 100% eff.

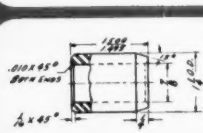
Operation: Face head, form back of head and neck.
Material: SAE 5120.
Production: 720 pcs/hr. @ 100% eff.



Operation: Form chamfer, groove, drill and cut off.
Material: Aluminum F.M.
Production: 680 pcs/hr. @ 100% eff.



Operation: Form diameter, groove, chamfer and cut off.
Material: Aluminum F.M.
Production: 510 pcs/hr. @ 100% eff.



Operation: Form chamfer both ends O. D. Break edges I. D. and cut off.
Material: Seamless tubing—SAE 1020.
Production: 600 pcs/hr. @ 100 eff.

The drawings above can only hint at the possibilities of the new, proven Motch & Merryweather Automatic. Study them closely, compare with your own requirements, and then

WRITE US FOR FULL INFORMATION, describing your needs.

Manufactured by

THE MOTCH & MERRYWEATHER MACHINERY COMPANY • 715 PENTON BUILDING, CLEVELAND 13, OHIO

Builders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT

STILL LEADER OF ITS CLASS!

PRESS-RITE

MODEL O 5 TON POWER PRESS

Compare it...

FEATURE FOR FEATURE!

ONLY $175.00
FOB ST. PAUL, MINN.
Base Price with Std. Equip.

- **HEAVY UNI-CAST FRAME** Provides greater strength and ruggedness, for continuous 5 ton operation.
- **GREATER SHUT HEIGHT** Full 7" to permit use of large bulky dies
- **4 POINT SLIDING KEY CLUTCH** Eliminates lost flywheel motion and power. Increases production.
- **NON-REPEAT SINGLE STROKE SAFETY MECHANISM** Builds operator confidence. Reduces rejects. Steps up output.
- **AUTOMATIC CAM ACTUATED BRAKE*** Instant braking at top of stroke. Full energy instantly on next stroke.
- **ANTI-FRICTION ROLLER BEARINGS*** Eliminates flywheel drag. Provides smoother action, and longer life.
- **OPEN BACK INCLINABLE** Construction just like the larger Press-Rite Presses.

NOT JUST ANOTHER 5 TON PRESS...

but a 5 ton press with features you'd expect to find only in larger presses... and it is only $175.00 FOB St. Paul.

See it! Use it! You'll agree you have never had a press that could compare with it feature for feature... or match its outstanding performance.

See it at your dealer or write for bulletin 348

Sales Service Machine Tool Co.

PRESS RITE PRESSES

SHAPE RITE SHAPERS

KELLER POWER HACK SAWS

2363 UNIVERSITY AVENUE
ST. PAUL 4, MINNESOTA

The Right Tools in his Hand . . .

PUT PROFIT INTO THE OPERATION

● If you want the best from every drillpress operator, give him the machine he can handle with minimum fatigue and lost motion — the drill that lends accuracy and skill to his hand — one of the complete line of "Buffalo" drills so widely used in industry today. For the profitable solution to your drilling problems, simply write:

"Buffalo"

BUFFALO FORGE COMPANY

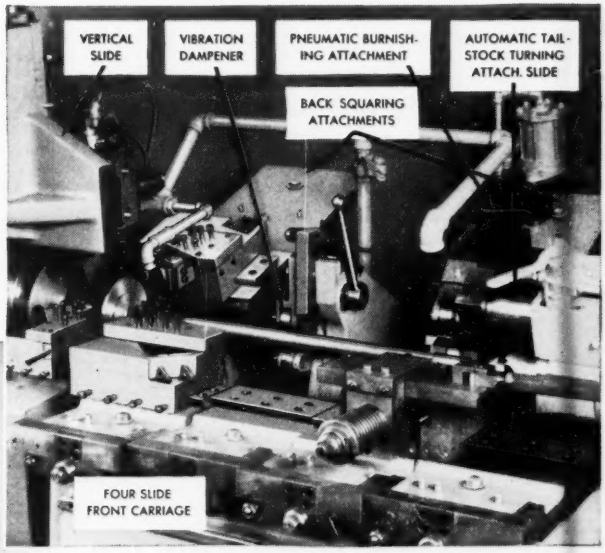
388 BROADWAY BUFFALO, N. Y

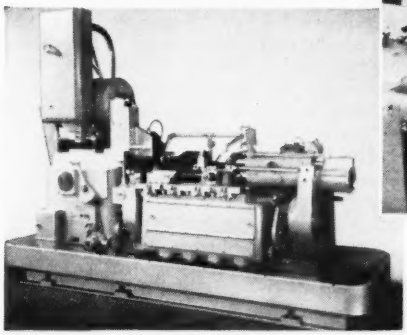
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE Lo-swing PEOPLE"** SENECA FALLS, NEW YORK

MODEL AR Lo-swing LATHE ROUGH AND FINISH TURNS AXLE SHAFTS IN ONE OPERATION AT HIGH PRODUCTION RATE





Problem: To rough and finish turn axle shafts with two cuts on flange faces and splined end, and to burnish oil seal diameter.

Solution: The Model AR Lo-swing Lathe selected for this job was equipped with a four slide front carriage, two automatic back squaring attachments, a vertical facing slide mounted on the headstock and an automatic tailstock turning attachment.

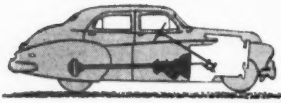
The shafts are delivered to the Lo-swing Lathe with ends centered and with two shallow driving pin holes drilled in the flange. After mounting the shaft between centers, a spring operated "Vibration Dampener" is set against the rough forged shaft to eliminate whip and vibration at high cutting speeds.

The machining cycle is divided into two distinct phases ...roughing and finishing. The front carriage and back attachment tools operate simultaneously, rough turning and rough facing the flange as well as the bearing diameters and the splined end. The roughing tools are then withdrawn from the cut and the flange is finish faced with tools mounted on the third slide, while a separate tool mounted on the tailstock turning attachment takes a light finishing cut over the splined end of the shaft. The burnishing attachment moves into position during the latter part of the finish turning and burnishes the oil seal diameter situated near the splined end. All operations are performed automatically, the operator simply loads and unloads the part. Total floor to floor time is 1.05 minutes per shaft.

Let Seneca Falls engineers assist you with your turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

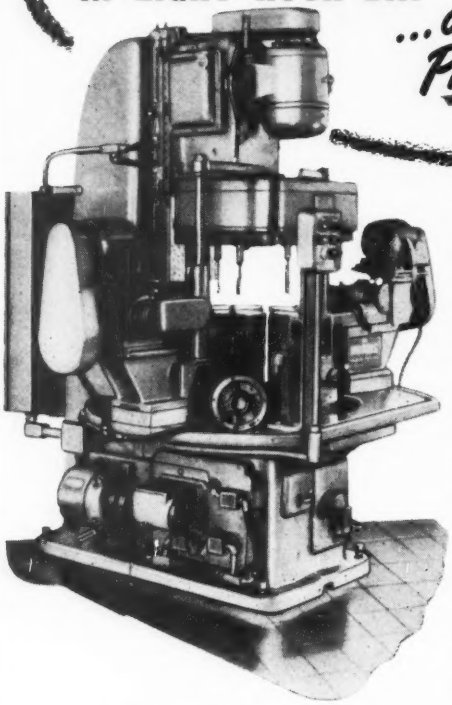
PRODUCTION COSTS ARE LOWER WITH Lo-swing



Automobile manufacturer speeds production

600 AUTOMATIC TRANSMISSION COLLECTOR RINGS DRILLED AND REAMED IN EIGHT HOUR DAY

...on MORRIS Production Machines



The drilling and reaming of Collector Rings presented a bottle-neck to increased production of automatic transmissions for a prominent automobile manufacturer. Morris engineers were asked to produce a machine which would provide the production required at the desired efficiency.

The solution consisted of the Morris Vertical Four Station Automatic Indexing Machine illustrated. This production machine has a 24 inch table; one 3-spindle hydraulic vertical head and two single spindle rack fed auxiliary side heads with four mounted hand clamp fixtures. Seventy-five Collector rings are drilled and reamed per hour at eighty per cent efficiency.

If your work requires drilling, reaming, tapping or similar operations, on a production basis, Morris Machine Tool Company can design, develop and build a production machine to meet your specific job requirements.

THE MORRIS MACHINE TOOL COMPANY

"A better product at less cost— with MORRIS ENGINEERED PRODUCTION"

Builders of MOR-SPEED Line

933 HARRIET STREET CINCINNATI 3, OHIO

NOW . . . IN MEDIUM PRICED LATHES

Extra-Long Bed Lengths

Sebastian

GEARED HEAD

20" LATHES

20" x 20' LATHE

200" BETWEEN CENTERS

20¼" SWING

20" SEBASTIAN LATHE

Standard & Gap Types

AVAILABLE BED LENGTH	DISTANCE BETWEEN CENTERS
6'	32"
8'	56"
10'	80"
12'	104"
14'	128"
16'	152"
18'	176"
20'	200"

HANDLE LONG, SLENDER WORK PIECES

Increase Job Capacity . . . Step Up Profits!

Cut both initial and maintenance costs with this "KING Engineered" medium priced Sebastian Lathe. Handles a full range of work, including long, lightweight pieces ordinarily machined on expensive heavy duty lathes.

Outstanding features include all-geared, 8-speed headstock with Timken Bearings . . . reverse in apron for feeds . . . motor fitted in cabinet leg.

SEND FOR THESE FREE CATALOGS!

Illustrated Sebastian Catalogs S-1 (Standard Lathes) and S-101 (Special Lathes—Gap, Clutch & Brake, etc.) give complete description and detailed specifications. See for yourself why the modern Sebastian is today's outstanding value!

Distributors in Principal Cities. Consult Your Classified Telephone Directory or Write Us.

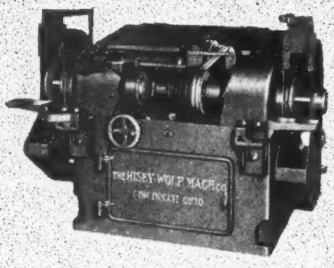
American Steel Foundries

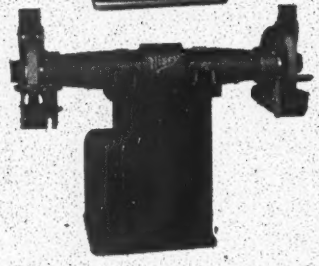
KING MACHINE TOOL DIVISION

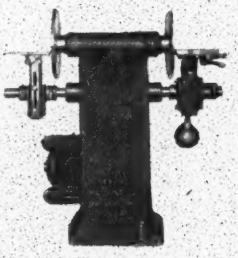
CINCINNATI 29, OHIO

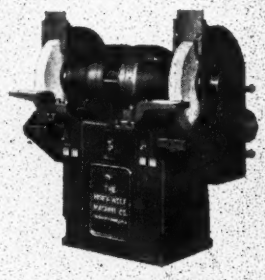
Builders of Vertical Boring & Turning Machines and Sebastian Lathes

GRINDERS?
Sure! All Kinds









Wet Grinders and Dry Grinders
Drill Grinders and Disc Grinders
Grinders with extra wide wheel spacing
Bench Grinders and Pedestal Grinders
Lathe Grinders and Center Grinders
Grinders for snagging or tools
Large Grinders and Small Grinders
High Speed or Low Speed
Grinders for production or tool room.

HISEY catalog No. 71 MA lists more than 200 different types and sizes of Grinders from 1/4 to 25 H.P. capacity.

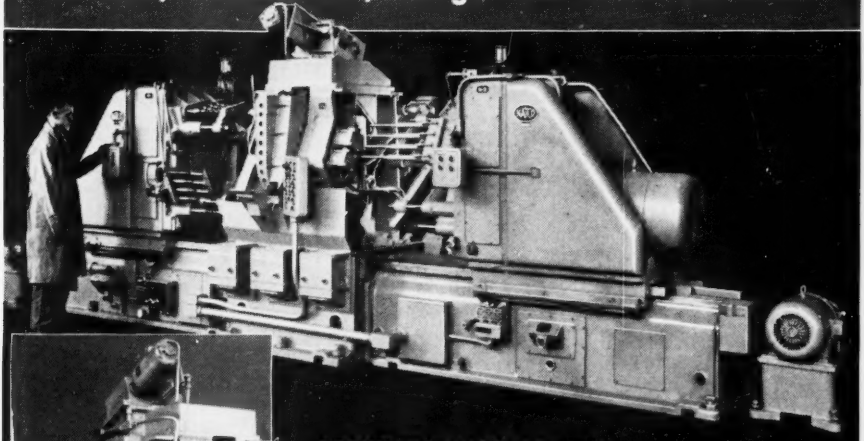
Write for it now.

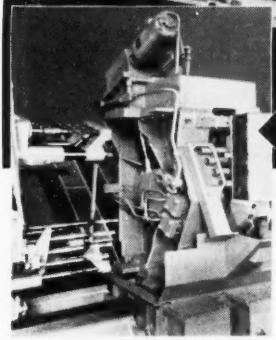
Also a complete line of Buffing and Polishing Machines in direct drive and V-Belt drive models.

THE HISEY-WOLF MACHINE CO.
CINCINNATI 8, OHIO
Division of The Cincinnati Electrical Tool Co.

575 PISTON PINS PER HOUR

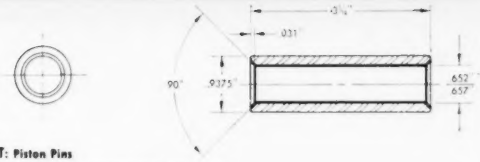
Drilled, Chamfered, Rough and Finish Reamed





THE PARTS are hopper fed, automatically loaded, clamped, unclamped and ejected

Chip conveyor attached to rear of fixture pedestal runs in under fixture and carries chips out of machine.



PART: Piston Pins

PRODUCTION: Approximately 575 parts per hour

OPERATIONS:

Position No. 1
Load four parts automatically

Position No. 2
Right and Left Hand Heads
Drill for .652" dia. 1/5 through

Position No. 3
Right and Left Hand Heads
Drill for .652" dia. 2/5 through and chamfer I.D.

Position No. 4
Right Hand Head
Drill for .652" dia. across center
Left Hand Head
Idle

Position No. 5
Right Hand Head
Rough ream through using accelerated spindles
Left Hand Head
Idle

Position No. 6
Right Hand Head
Idle
Left Hand Head
Ream through to .652/.657" dia. using accelerated spindles

Position No. 7
Unload four parts automatically

This is just one of many examples of the way NATCO machines contribute to higher production and lowered costs. Send us your drilling, boring, tapping and facing problems . . . our engineers have the solution.

Write today for NATCO "Success Story" No. 3 and investigate . . .

NATCO DRILLING, BORING, TAPPING AND FACING MACHINES

NATCO

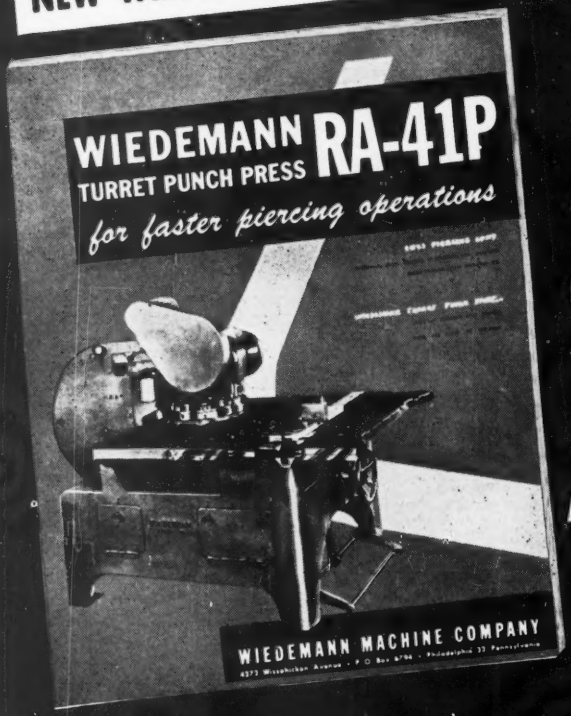
Call a Natco Field Engineer

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Ind., U. S. A.

Branch Offices: 1809 Engineering Bldg., Chicago • 409 New Center Bldg., Detroit • 1807 Elmwood Ave., Buffalo • 2902 Commerce Bldg., New York City

WE MAKE THIS POSITIVE STATEMENT:

"NO OTHER METHOD OF PIERCING SHORT RUNS* IN SHEET METAL CAN APPROACH THE SPEED AND LOW COST OF THE NEW WIEDEMANN RA-41P TURRET PUNCH PRESS."



SEE FOR YOURSELF WHY THE RA-41P CUTS PIERCING TIME 70 TO 85%! WRITE TODAY FOR YOUR COPY OF BULLETIN 241.

IT IS THE POLICY OF WIEDEMANN MACHINE CO. TO SELL EQUIPMENT THAT WILL PAY FOR ITSELF IN TWO YEARS OR LESS.

* The RA-41P is especially designed for jobs involving the use of a variety of different sized and shaped punches and dies in the same piece, such as panel boards, chassis, truck and light road machinery parts, etc. For this class of work the RA-41P provides unsurpassed efficiency and cost savings on runs of a few to a thousand of a kind . . . and often larger production runs.

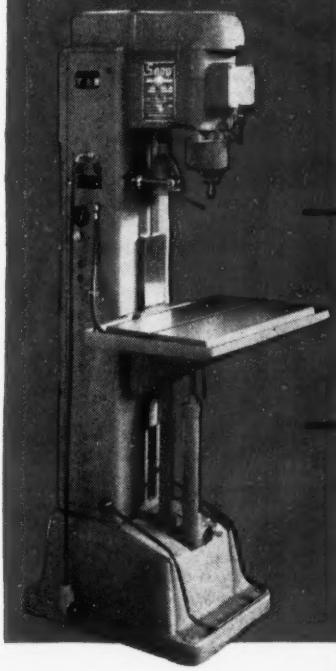
WIEDEMANN MACHINE COMPANY

4219 WISSAHICKON AVE. • PHILADELPHIA 32, PA.

SNOW

FULL UNIVERSAL MACHINES

For Top Production

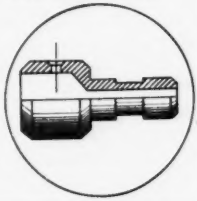


Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

DRILLING

Crossdrill and C'T" Sink 1/16" Hole

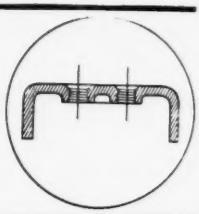
Material—Brass
Production—4800 per hour
Fixture—#15 Vertical index
Equipment—#1-UD Drilling Machine



TAPPING

Tap Two #10-32 Holes

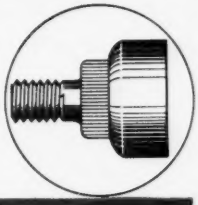
Material—Steel stamping
Production—3800 tapped holes per hour
Fixture—#14 horizontal index
Equipment—#1-UT tapping machine



THREADING

3/8"—24 Thread—1/2" Long

Material—Die Cast Aluminum
Production—2500 per hour
Fixture—#10 Drum dial
Equipment—#3-TR Threading machine



Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtures All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production.

Sensitivity of power application prevents tool breakage.

Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fatigue.

SNOW

MANUFACTURING COMPANY

435 Eastern Ave., Bellwood, Illinois
(Chicago Suburb)

Single Spindle Verticals • Two-Spindle Verticals • Two-Spindle Horizontals • Automatic Nut Tapping Machines • Drill Press Tap Heads • Automatic & Semi-Automatic Jigs & Fixtures

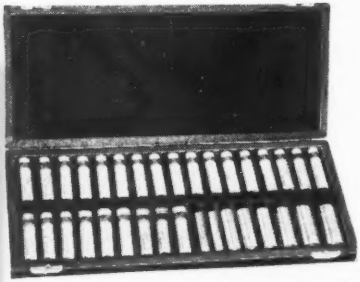
Submit Sample Parts for Production & Cost Estimate

ACCURACY the EASY WAY...

with the

Van Keuren >>>> GEAR MEASURING SYSTEM

Spurs, Helicals, Splines, Serrations



Set No. 26 EX. External Gear Measuring Wires. $140.00.

THE Van Keuren Gear Measuring System is generally accepted as the easiest and most accurate method of checking tooth thickness of gears, 30° involute splines and 90° involute serrations. A measurement is made over two opposing wires and this actual measurement is compared with the theoretical measurement over wires for a perfect gear as computed from the Van Keuren tables for 1 diametral pitch gears.

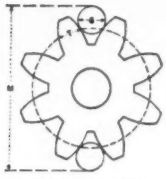
The only equipment required is a set of 2 wires of the proper size for each diametral pitch.
Standard sizes of wires available from stock are:—

1.728″/DP for external spurs and helicals.

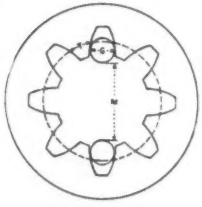
1.44″/DP for internal spurs and splines.

1.92″/DP for enlarged pinions, 30° involute splines and 90° involute serrations.

1.68″/DP Alternate series for special requirements.



EXTERNAL SPUR GEAR



INTERNAL SPUR GEAR

SIMPLE . . . . . For spur gears, involute splines and serrations, the only calculation is one of simple division. For helical gears use the simplified computation forms VK-103, VK-104 or VK-105.

RELIABLE . . . The 1.728″/DP System is used by over 90% of American gear producers and users. The 1.44″/DP and 1.92″/DP systems have been incorporated in standards for involute splines and serrations.

ACCURATE . . . The Van Keuren Gear Tables are complete for gears from 5 to 500 teeth and for pressure angles of 14½°, 17½°, 20°, 25° and 30°. If the measurement over the wires is greater than the value calculated from the tables, the tooth is too thick and the cutter must be fed further into the gear blank. Constants for controlling tooth thickness and backlash to .0001″ are given for all pressure angles.

MEMBER OF AGMA

VAN KEUREN CATALOG AND HANDBOOK NO. 34

This 208 page volume represents two years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies free upon request.

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31st Year

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

New Behr-Manning belt methods

Cut contour polishing costs

Now you can polish contours with *fewer operations* and *without wheel marks*. And you can do an easier, superior buffing job after polishing — *no wild grain marks* to eat up production costs, labor and equipment time.

This new way of contour polishing has been developed by Behr-Manning application engineers, utilizing fast-finishing, cool-cutting flexible abrasive belts and special contact wheels.

See this method demonstrated in your own plant on your own work. Take this first step to gain an immediate production advantage on contour polishing operations.

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Use NORTON® abrasives sharpening stones

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I'd like to see a free demonstration of the new Behr-Manning contour polishing method.

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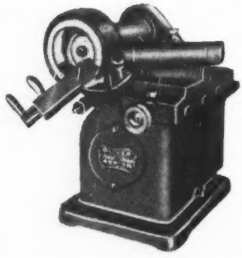
CUT DRILL GRINDING COSTS



The wide acceptance of OLIVER DRILL POINTERS by industry is based on the fact that they do reduce costs. Time studies show savings up to 400% in production of sharp drills over old methods.

Drills sharpened on the OLIVER Drill Pointer are theoretically perfect. The points are uniform; they last longer between grinds and use less feeding pressure.

The OLIVER Drill Pointers produce points of constant uniformity that are so essential in multiple spindle drilling. All drills cut alike which results in accurate uniform holes.

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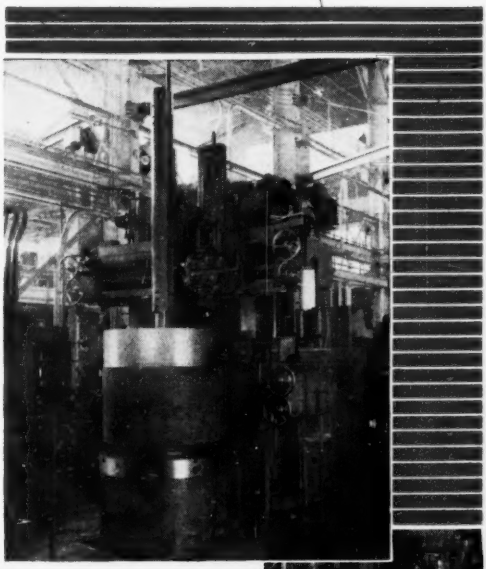
Rugged Work in a Foreign Land

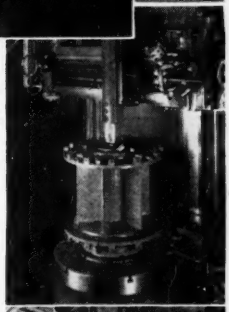
Requires an Especially

Rugged Machine

Selection of Bullard Cut Master for foreign duty bespeaks confidence in Reliability of Performance with minimum liability of breakdowns.



BULLARD



Fixture and Bull Center used to hold the work rigid.

This 54-inch high bed **Bullard Cut Master** going to India was selected for this tough job because of its especially rugged construction.

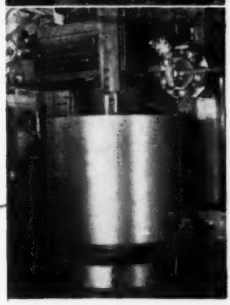
The 3 Head combination exactly met the requirements of this particular job.

Main Ram Head with anti-friction bearing Bull Center holds the internal fixture rigid against the heavy cutting required.

Side Head takes a long heavy cut with three tools on the full length of outside diameter. Then an interrupted undercut is made on the bottom surface to finish-off numerous lugs.

At the same time undercutting is in operation, the Turret Head is used to face-off the lugs on the top surface.

Write for circular illustrating Cut Master's rigid construction and describing its manufacturing refinements.



THE BULLARD COMPANY

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A MEDIUM-SIZE LATHE *Provides*

Wide Job-Flexibility

Few Non-Productive Hours

ROCKFORD 16" ECONOMY LATHE

Capacity for a wide variety of work — few non-productive hours, resulting from a constant flow of work — these are production advantages in a *medium-sized* lathe which provide reduced costs and quick investment return.

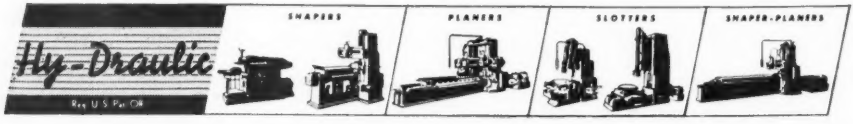
MEDIUM-SIZED

ECONOMY-PRICED

Rockford 16" Economy Lathes offer unbelievable first-line features in this medium-size class, with a price range that is hard to equal. Speeds for Carbides, Timken-Mounted Gear Shafts, Separate Lead and Feed Screws, and All-Geared Head adapt it to almost any job within its 16½" swing.

Ask your dealer about it today. It's *Medium-Sized* and *Economy-Priced.* Write for full details, contained in Bulletin No. E-900-5.

ROCKFORD MACHINE TOOL CO. • ROCKFORD, ILLINOIS



more powerful, more compact lighter weight drills

Here are the perfect answers to the rapidly growing demand for shorter, less bulky, high output industrial drills. They are Millers Falls new, close coupled No. 438 3/8" Heavy Duty and No. 512 1/2" Standard — two great new models with performance unexcelled by any other drills in their price class.

Incorporating the very latest in design and engineering, they pack tremendous power and endurance into remarkably small dimensions. Only 14" overall, they measure a bare 11" with spade handle removed. Thus they permit work in extremely close quarters . . . the difference between minutes and hours on many maintenance jobs.

They are light, too — only 9 1/2 lbs. — yet their powerful motors and full anti-friction bearing construction give them exceptional efficiency for continuous production work.

Whether you use portable electric drills for maintenance or production, you'll find it well worthwhile to try out these superlative new tools. They are truly outstanding performers. Write today for full details and name of your nearest distributor.

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MILLERS FALLS COMPANY

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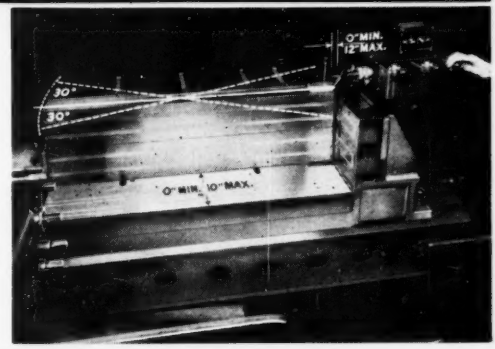
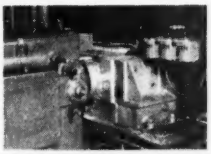
How To Save Time
IN YOUR MILLING DEPARTMENT WITH A SUNDSTRAND GENERAL PURPOSE MAGNETIC FIXTURE

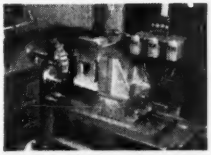
Here's a new work-holding fixture for general purpose milling work. It saves on miscellaneous milling jobs by eliminating time losses for adjusting mechanical clamps and the cost of special jigs or fixtures. It is a complete unit with Sundstrand Magnetic Chucks mounted on an adjustable fixture. Chucks are quickly positioned as required by the size of work piece and easily adjusted for angular milling cuts. If you have miscellaneous milling jobs requiring frequent changeover from one part or cut to another, it will pay you to



Sundstrand Magnetic Fixture showing adjustments. Note clamping is performed by merely throwing switch.

investigate the savings possible with this new magnetic holding fixture. Sundstrand Magnetic Chucks are operated with an automatic demagnetizing control. There is no tube in rectifier to burn out. Generally, the input of the control unit is 110 volt A.C., which is rectified to 6 volt D.C., which in turn energizes the chuck. The low voltage eliminates possibility of shock to the operator, and no heat is produced to affect accuracy. Controls with inputs other than 110 volt A.C. can be furnished when required.





TYPICAL SET-UPS

These three set-ups illustrate only three of many different parts that are being run over one general purpose magnetic fixture in the manufacturer's plant.

•

Top — Milling steel tool blocks. Parts are run in lots of one to ten and are machined all over.

Center — Milling three steel cam bars simultaneously. Bars are 33⅝" long x 2½" wide and 1¼" thick and are milled all over in six operations.

Bottom — Milling cast iron motor bracket slide. Part is held for eight different cuts with same fixture.

FREE
Additional Data

Complete information on Sundstrand Magnetic Chucks Will be sent on request. Ask for bulletin 594M.

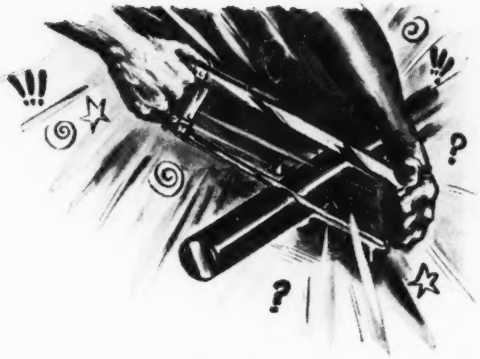
See this magnetic work-holding fixture demonstrated in booth No. 907 at the A.S.T.E. Show April 10 to 14 in Philadelphia.

SUNDSTRAND MAGNETIC POWER-GRIP CHUCKS

SUNDSTRAND MAGNETIC PRODUCTS CO.
Division of Sundstrand Machine Tool Co.
1306 18th AVENUE • ROCKFORD, ILLINOIS

NO MORE

hacksawing drudgery that everybody hates.



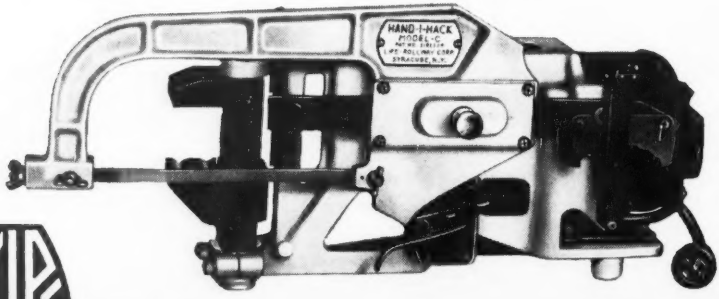
NOW!

HAND-I-HACK*

*Trade Mark
Reg. U. S. Pat. Off.

PORTABLE POWER HACK SAW

Hand-I-Hack will eliminate this drudgery. It's light—easily carried to the job. It will work in any position. It will pay for itself quickly in labor saving and broken blade costs alone. Capacity 3" x 3". Write for literature



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The wide variety of types and sizes available in Brown & Sharpe Quality Pumps simplifies your selection of *the right pump for the job.* Send for latest pump catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

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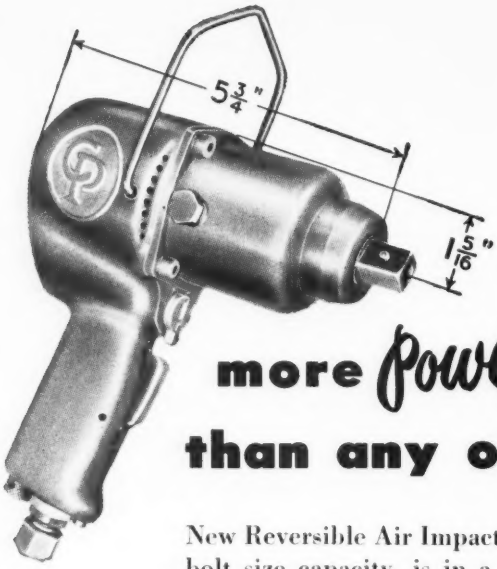

more *power per ounce* than any other wrench

New Reversible Air Impact Wrench (CP-3440), with 3/8" bolt size capacity, is in a class by itself for tightening and removing nuts and bolts . . . driving and removing wood screws, lag screws, studs . . . tapping.

Less than six inches long . . . weighing but 4½ pounds . . . packs 50% more power than previous models of same capacity.

Power regulator controls tightness of nuts.

Stands rough usage . . . all steel clutch housing . . . heat-treated aluminum motor housing and handle.

New lubricating system: simplifies clutch lubrication . . . oil instead of grease . . . wearing parts of motor protected by re-usable cartridge type wick lubricator.

Does the job in places where longer tools cannot be applied. *Write for Bulletin SP-3011.*

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General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
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Lower cost Jig Grinding

proved by Vulcanaire for over 3 *years*

HOW? You place the Vulcanaire quickly in the spindle of your jig borer or mill.

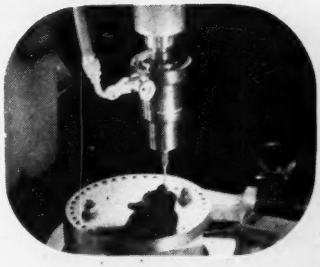
NOW! You can locate—finish grind holes in hardened steel to "tenths" at controlled speeds up to 65,000 R.P.M. . . . grind dowel holes—square with a ground base . . . move location of holes in hardened steel blocks . . . grind interchangeable holes in hardened sections . . . grind .032 to ⅛" holes with diamond impregnated laps . . . grind contours and relief with tungsten carbide burrs . . . grind radii in die sections . . . grind contours in gages . . . jig grind large and awkwardly shaped components . . . eliminate jig bushings in tools where close spacing is essential.

PRECISION! Jig ground requirements are being designed into tools by the most enlightened engineering departments . . . Jig ground the hardened die, stripper plate, and die holder all fit together . . . uniform clearance means longer runs.

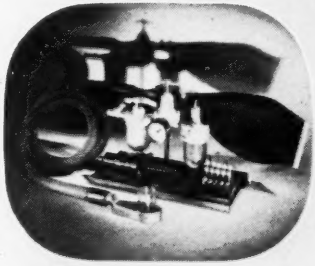
ADVANTAGES! The investment is less than for many Jig Boring accessories such as a rotary table . . . the Vulcanaire can be put on and taken from the machine in a few seconds . . . the Vulcanaire is completely portable (all accessories are platform mounted) . . . the system can be used between several machines of various capacities . . . employing both the 10,000 and 20,000 series, components with various sized holes from the very smallest to 4" in diameter can be Jig Ground . . . the average Jig Borer operator becomes proficient at Jig Grinding after very little experience.

TOPS IN PRECISION! . . . the Vulcanaire is precision built throughout and is constructed of alloy and tool steel. Super precision bearings, preloaded with our special fixtures are used, with all traces of radial and end clearances removed, resulting in Vulcanaire Jig Grinding to "tenths".

For quotation and literature please mention machine tool application.



FOR JIG BORERS OR MILLS



COMPLETE SYSTEM INCLUDES DUST ELIMINATION

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BUILT BY TOOLMAKERS FOR TOOLMAKERS

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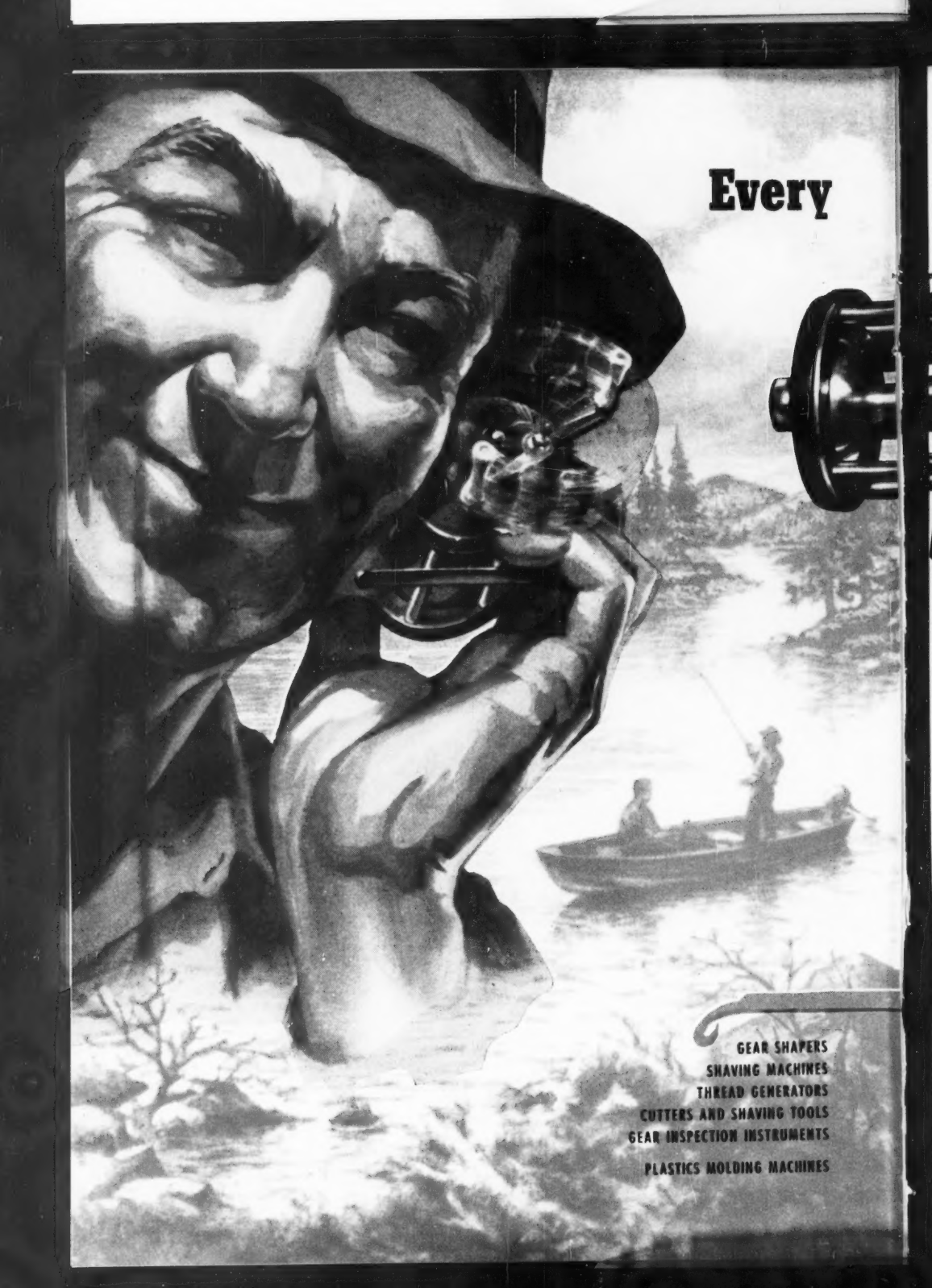
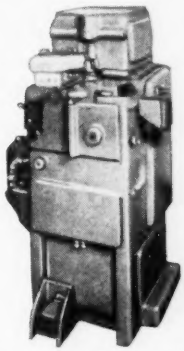

Every
GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS
PLASTICS MOLDING MACHINES

Outdoorsman's *a whispering*

Low Cost FELLOWS-Cut Gears Combine Superlative ACTION with Superlative QUIET...

The 3 inch Fine-Pitch Gear Shaper cuts this 9/32" face, 12-tooth 54 D.P., .220" P.D. pinion of SAE 1112 steel at 1200 strokes per min. The mating 5/32" face, 48-tooth gear of naval brass is cut at 2000 strokes per min. Time, floor to floor, is 35 and 45 seconds respectively.

In manufacturing gears for the popular-priced Castomatic OUTDOORSMAN, the Quaker City Gear Works, working with Fellows engineers, evolved a new 15° helix angle "quadruple multiplying" pair of gears—one steel, and the other brass. They are cut at cost-saving speed on the little Fine-Pitch Gear Shaper. Phenomenally quiet through the accuracy inherent in generated involutes, the action has ideal smoothness and freedom of spin. Better reels are in the offing, for all fishermen!... The same Fellows 3-Inch Fine-Pitch Gear Shaper has speed capacity (up to 2,000 strokes p.m.) to produce precision gears for any industry with eye-opening economy. Investigate—and cut better gears for less money!



This machine can be arranged with magazine attachment for automatic loading and unloading of stem pinions, ganged thin blanks, etc.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department, 78 River Street, Springfield, Vermont, U.S.A.
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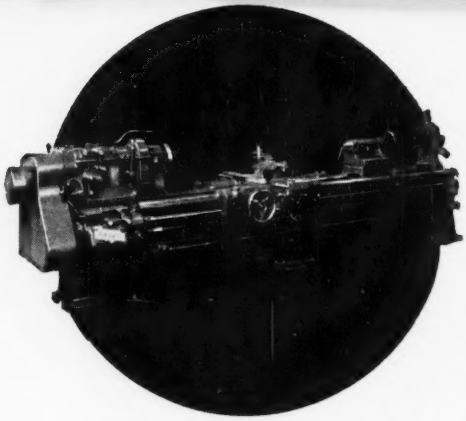
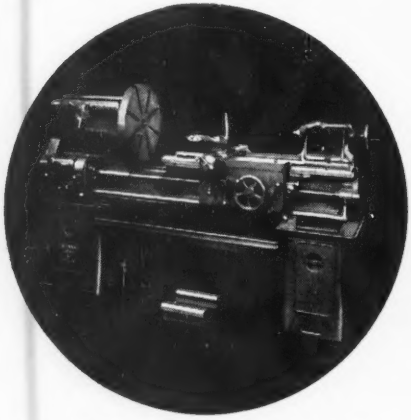
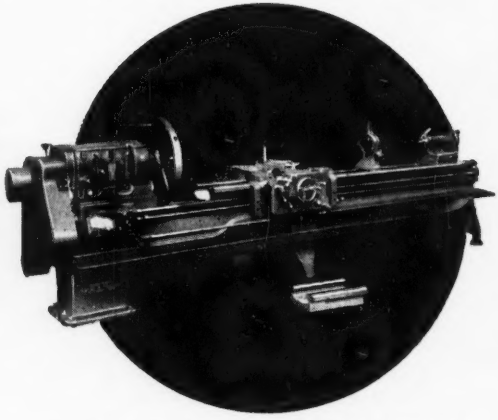
Tray-top Engine & Toolroom Lathes—10, 12½, 15 & 18 swing sizes. Bulletin T-100



Standard Engine Lathes—14, 16, 18, 20, 22 & 24 swing sizes. Bulletin S-100



Tray-top fixed gap bed Engine Lathes —15 & 18 swing sizes. Bulletin T-100



Standard fixed gap bed Engine Lathes—14, 16, 18, 20, 22 & 24 swing sizes. Bulletin S-100

+ plus value

Cincinnati Lathe & Tool Co. announces with pride the acquisition of one of the largest, oldest, and most widely recognized lines of light, upright, sensitive, and radial drilling machines – formerly produced by The Canedy-Otto Manufacturing Company. So now, from one organization, you can obtain the best in economy priced drilling machines and accessories as well as medium (Standard) and light duty (Tray Top) lathes, backed by a leading name in lathe manufacture. Write today for new catalogs.

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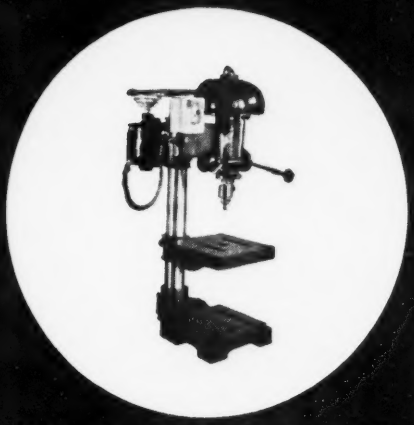
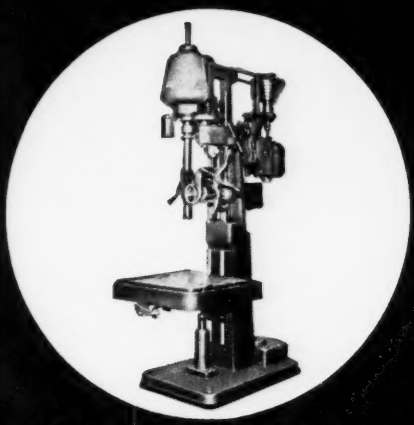
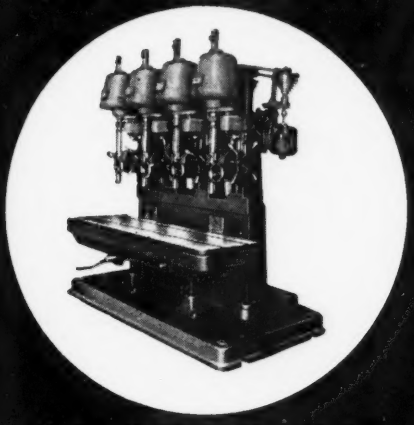


16" Royal sensitive bench and floor drill, single and multiple spindles. Bulletin 216.



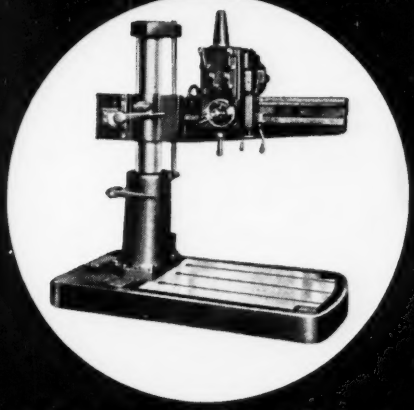
21" Box column sliding head floor drill, single spindle. Bulletin 100A.



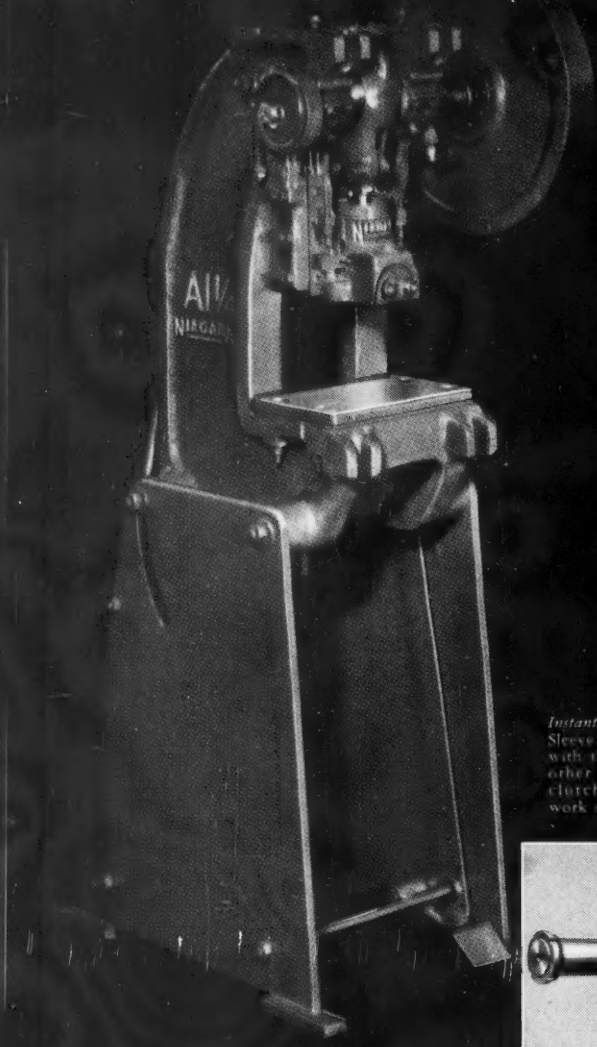
21" Box column sliding head floor drill, multiple spindle. Bulletin 100A.

18" Royal sensitive bench and floor drill, single and multiple spindle. Bulletin 218.

16" Box column sliding bench and floor drill, single spindle. Bulletin 155V, 119, 215.



Radial drills—3', 4', 5' arms; 7", 9" and 11" column. Bulletins 116 and CO-15.

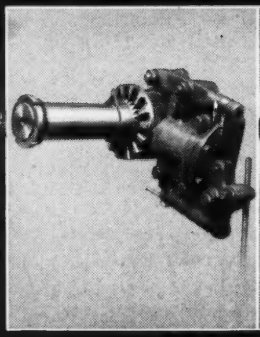


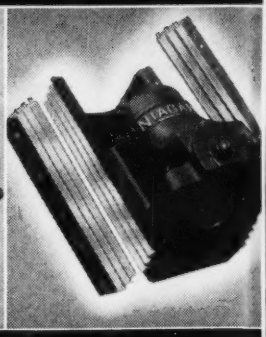
ONLY

● You get the same advanced design in small Niagara Inclinable Presses as you get in the largest sizes. Don't overlook the importance of this because small presses run as much as 6½ times as fast as large presses. Regardless of size you get quality when you get Niagara Inclinable Presses.

Instant Engagement of the Sleeve Clutch as compared with the slower action of other mechanical press clutches produces more work strokes per hour.

Multiple "V" gibs provide more guiding surface which minimizes wear, maintains alignment of slide with bed and and thus increases die life.





NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

NIAGARA

SMALL INCLINABLE PRESSES

Give you all these

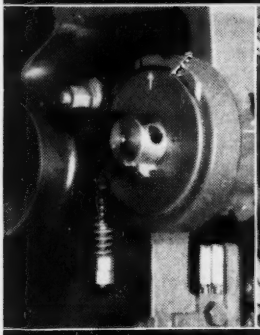
BIG PRESS FEATURES

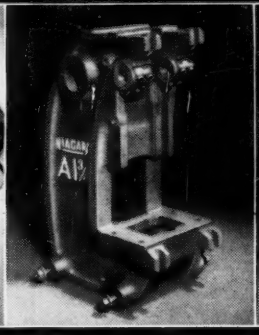
Brake automatically compensates for wear as well as expansion due to heat of operation. Drum and band marked to indicate correct adjustment.

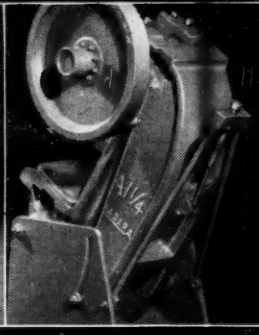
Slide designed to assure solid backing for die from center to front as well as rear. Breech block die clamp gives solid backing to punch shoe.

Frame designed to provide solid gib mountings . . . strength at the crankshaft bearingsand a rigid gap maintaining close alignment of punch and die.

Inclining mechanism easily operated by one man. Working height is not materially changed when press is inclined.



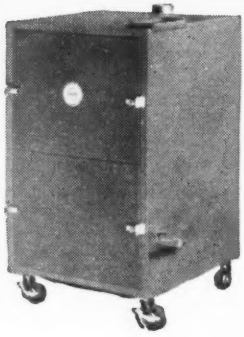




DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

EASY TO SOLVE

"The next card I turn over will be the card you selected." (This is an old one with variations that we'll explain if you write us. It's free, of course.)



TORIT
DUST COLLECTORS
in mobile units

When lathes, grinders, etc., are used intermittently, one Torit Dust Collector can often be used. For this service we offer cabinets mounted on casters, and equipped with flexible suction tube assemblies.

Dust problems are easy to solve when you use

TORIT DUST COLLECTORS

Torit Dust Collectors are self-contained units, compactly designed to fit into your production setup. They can be placed almost anywhere, and usually require only a few feet of piping.

Torit Dust Collectors run only when the machine is operating, to minimize power consumption. The filtered air is recirculated into the room so no outside vents are necessary.

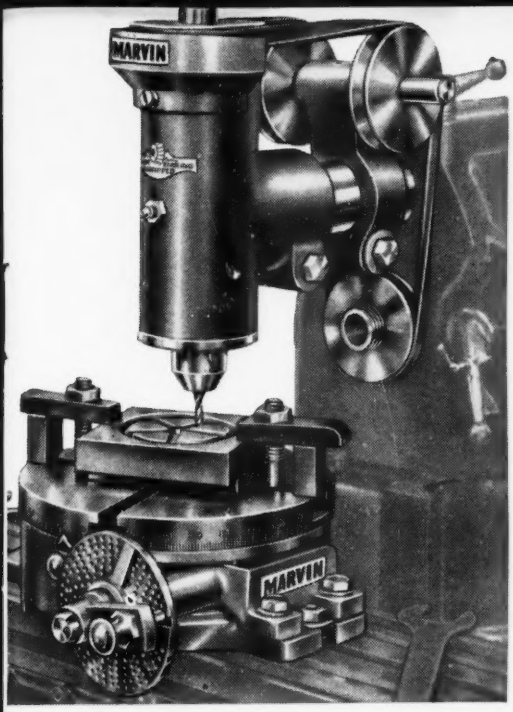
Torit Dust Collectors are stocked for immediate delivery. If you will outline your dust problem, our engineers will be glad to suggest types and sizes, and quote figures.

TORIT

Manufacturing Co.

296 Walnut St., St. Paul 2, Minn.

P.S. Ask for latest Torit catalog.



Marvin MACHINE TOOL ATTACHMENTS *"Precision Engineered"*

Marvin attachments are precision engineered by tool men of long tool room experience, designers who know precisely the exacting demands of modern industry. This knowledge is reflected in the versatility and operation of Marvin Machine tool attachments. They are paying off in lower costs and higher quality work.

(Illustrated Above)

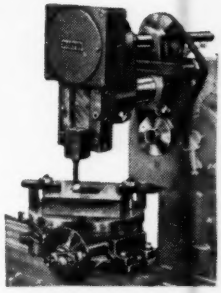
MARVIN VERTICAL MILL ATTACHMENT. No. V-1200, a Head combining simplicity and high performance with low cost. This Marvin Head can be set at angles, pulled out far past the travel of the table for large overhanging work. Simple to attach. Has a heavy spindle equipped with Timken tapered roller bearings which assures smooth operation at high speeds. Spindle nose takes end mills with 3/8" straight shank, up to 1/2" diameter cutter. Unit is machined to slip over 1 1/2" overarm. Easily adapted to other size overarms. Height 7 1/2". Price $65.00.

MARVIN ROTARY INDEX TABLE. No. 7-1102. A strong rigid precision table at a moderate price.

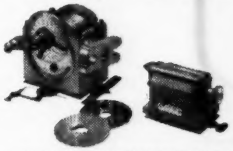
The 6" table is graduated in degrees and has T slots for 3/8" bolts, with a bushing in the center. Table locks from the bottom. It cannot tilt. Cast iron worm wheel, hardened and ground worm (40:1 ratio). Worm can be disengaged. 3 index plates with 6 sets of holes each give a wide range of divisions. Hand wheel also furnished, graduated in 1/2 degrees. Height 2 5/8" . . . which gives ample working space. Price $93.00.

You are cordially invited to inspect Marvin Machine tool attachments in operation at Booth No. 1010, A.S.T.E. Industrial Exposition at Philadelphia, April 10-14, 1950.

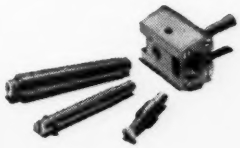
Copyrighted by H. B. Hazerodt 1949.



MARVIN SLOTTING ATTACHMENT. No. S-1070



MARVIN DIVIDING HEAD. No. B-1400



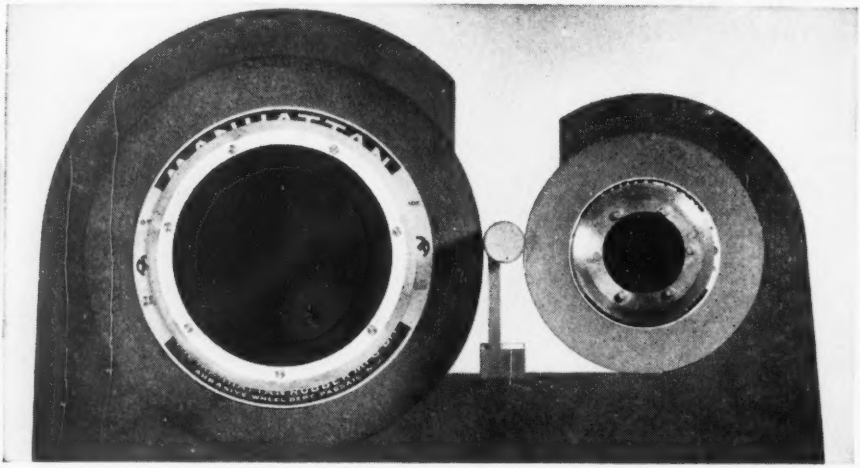
MARVIN MICROMETER BORING HEAD. No. M-1000T

MARVIN MACHINE PRODUCTS, INC.

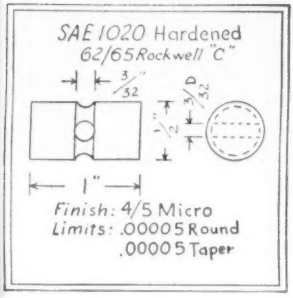
SALES OFFICE 414 FORD BLDG. DETROIT 26, MICHIGAN

Performance Proves the Quality of

MANHATTAN RUBBER BONDED CENTERLESS WHEELS



ROUGH AND FINISH with SAME WHEEL



Regulating Wheels — Plain — Core Mounted — Manhattan Core Mountings Effect Substantial Savings

Example #1: Roughing and Finishing ½" dia. x 1" long SAE 1020 Pins (Soft and Hard)

Performance of 20x6x12—4660 Q64 KLE Wheels

Rough soft—2 passes .005/.006 each—hold tolerance to .0002
Rate of feed 70 pieces/min.—Grinding wheel speed 1200 RPM

Pins hardened at this point to 62/65 Rockwell "C"

Finishing hardened—Filmatic Bearing Machine—wheel speed 1600 RPM
3 passes .001/pass for sizing and rounding up
Final pass .0015—3 to 4 micro finish—hold tolerance—.000025

Example #2: Roughing and Finishing Miscellaneous Materials

Performance of 20x6x12—80100 Q52 BV5 Wheels at 1200 RPM. On all these jobs wheels held good size with infrequent dressings:

5/8" dia. x 12" long SAE 1020 Soft Rod
3 passes—.008, .004 and .001 to 4 or 5 micro finish

½" dia. x 5/8" long Hardened Steel Bushing
Infeed—.008 removal—very good finish and size

¼" dia. x 8' long—Stainless Steel Bars
2 passes—.010/.012 and .002/.003 to excellent finish

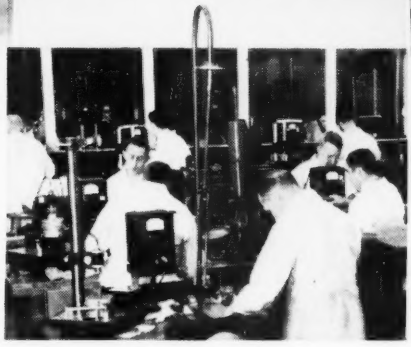
ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION

PASSAIC, NEW JERSEY

Division of RAYBESTOS-MANHATTAN, INC.

Products that require close inspection merit JO-BLOCK PROTECTION



A section of the special, air-conditioned, temperature-controlled department at Brown & Sharpe, where all finishing operations of Johansson Gage Blocks are performed.

If your products must meet close standards of accuracy, they'll warrant the use of measuring equipment periodically checked against Brown & Sharpe Jo-Blocks. With this protection, finished work meets specified tolerances consistently. Errors caused by poorly set measuring tools or worn gages will be caught before they can do serious harm.

Every modern facility and every engineering skill used by Brown & Sharpe in the manufacture of precision machines and tools is available to maintain the world-famous accuracy of Johansson Gage Blocks. Send for new Brown & Sharpe booklet describing Johansson Gage Blocks and Accessories. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

Visit Booth No. 849, A.S.T.E. Show, Philadelphia

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We urge buying through the Distributor

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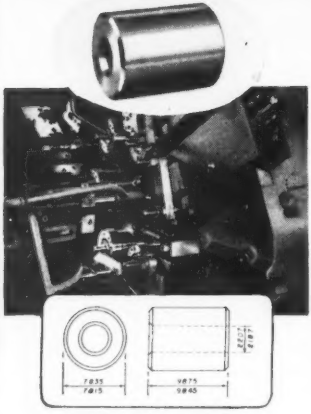
INTERNATIONAL HARVESTER PUTS...

EMPHASIS ON QUALITY

WITH GREENLEE SIX-SPINDLE AUTOMATICS



CONTROL SYSTEM SAVES TIME FOR FOREMAN

A system of quality control and a little teamwork between the inspection and screw machine departments of International Harvester Co., Milwaukee, has elevated production standards and lowered scrap losses in the manufacture of parts for Diesel Engine Injection Pumps.

In the screw machine department pictured above, where four Greenlee 6-Spindle Automatics are at work, the inspector makes an hourly spot-check of parts produced by each machine. It is an important part of a quality control system which aids operators, helps maintain standards, and at the same time allows the foreman more time to handle set-up, tooling, and scheduling problems.

Fitting into this production plan, Greenlee Automatics are called upon to produce parts with a good degree of accuracy and handle both short and long run jobs economically.

TYPICAL JOB:

The above part for an International Diesel Engine Injection Pump is produced on a 1" Greenlee "6". The part, a nozzle valve guide, is completed as shown with a tolerance of .002" on the hole diameter. A later operation grinds the hole to .0005" tolerance. An accelerated reaming attachment is used as shown in the 6th or cutting position for the finishing operation of the center hole. The accelerated action of the attachment permits its use on the Greenlee in four positions, including cut-off.

WRITE TODAY FOR NEW LITERATURE describing quick-change features and the new interchangeable lead-screw threading feed for the Greenlee Automatic. Ask also for details on the 16 mm. sound movie describing the building of a Greenlee "6"

PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1883 MASON AVENUE
ROCKFORD, ILLINOIS

DETROIT OFFICE:
504 Curtis Bldg., Detroit 2, Mich.

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

Fast production demands correctly ground drills

SELLERS DRILL GRINDERS

The Sellers method of grinding automatically produces the scientifically correct drill point required for precision work. Angles of inclination are equal, contour of lips is identical, resulting in a point that drills cylindrical holes faster with more holes per grind.

Inexperienced help is quickly trained to turn out a constant supply of perfect drill points, reducing both your drilling costs and drill inventory.

Sellers Drill Grinders are available in three sizes. 1-G, 4-G and 6-G.

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

SELLERS 4-G DRILL GRINDER
(A Dry Grinder)

The Sellers 4-G Drill Grinder is recommended for grinding right hand twist drills and flat twist drills: 2, 3 and 4 lip drills up to 2". It has an actual maximum capacity for 2 and 4 lip drills up to 3" diameter and for 3 lip drills up to 2 5/16" diameter. Lips are ground to equal length, angle and clearance. Clearance produced by the Sellers method is sufficient to insure free cutting without weakening cutting edges. This clearance is automatically determined by the machine for different sizes of drills.

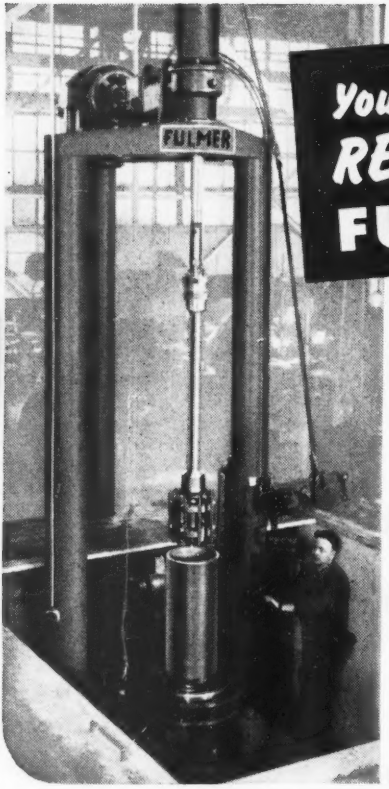
Full information covering any size Sellers Drill Grinder will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK



Fulmer Model 20-72 honing large Diesel liner.

You Get FAST STOCK REMOVAL with FULMER HONING MACHINES

Read These Typical Production Examples:

1 ***NITRIDED STEEL AUTOMOTIVE CYLINDER LINER***
3.06″ bore x 6.43″ length x .040″ thick. .005″ of stock is removed to ±.00025″ tol. in less than 1½ minutes per piece.

2 ***GAS ENGINE CYLINDERS***
11″ bore x 30″ length. .008″-.012″ of stock is removed in 4 to 5 minutes.

3 ***FORGED GEAR PINION***
Two 4.250″ bores, in line, each 6″ in length. .005″ of stock is removed with surface finish of 10-12 micro-inches in 1 minute. Saved 90% on production time, improved finish 1000%, over previous reaming operation.

4 ***SEMI-STEEL DIESEL LINERS*** (Illustrated)
12¾″ bore x 30¾″ length. .006″-.008″ of stock is removed in 5 minutes. Previous *honing* time was 2 *hours!*

Any internal cylindrical surface, ½″ to 30″ diam., can be finished faster, more accurately, at *less cost* by FULMER HONING. These machines offer the greatest value in the honing field. Investigate their advantages for your production. Write now for details and your copy of new 12-page honing bulletin.

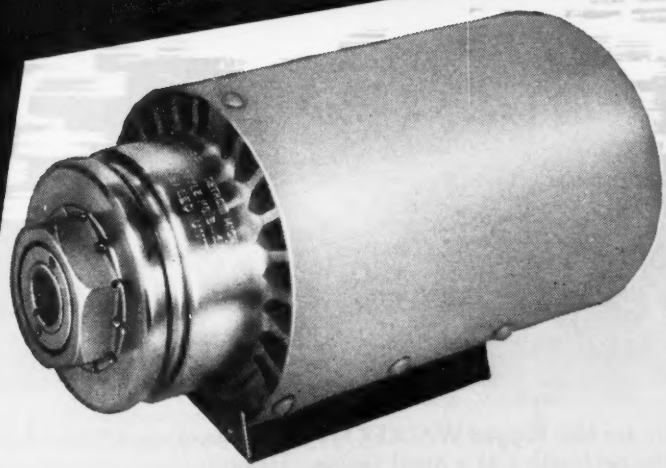
Fulmer Company is sole U.S. distributor for the famous line of Alexander Ball Honing Tools. Now available in sizes from ½″ to 50″ diam. Write for complete information and prices.

C. ALLEN FULMER COMPANY

1233 First National Bank Bldg. **Cincinnati 2, Ohio**

EX-CELL-O *Spindles*

"STEPPED UP PRODUCTION TREMENDOUSLY!"



That's what an electrical manufacturer says about a group of Ex-Cell-O Precision Spindles he purchased. These were of the high frequency, inbuilt motor type, pictured above. If you use precision grinding spindles send for the Ex-Cell-O Spindle Catalog today—no obligation of course. For a quotation on special spindles just send a sketch with basic dimensions and state the speed and horsepower required.

XLO

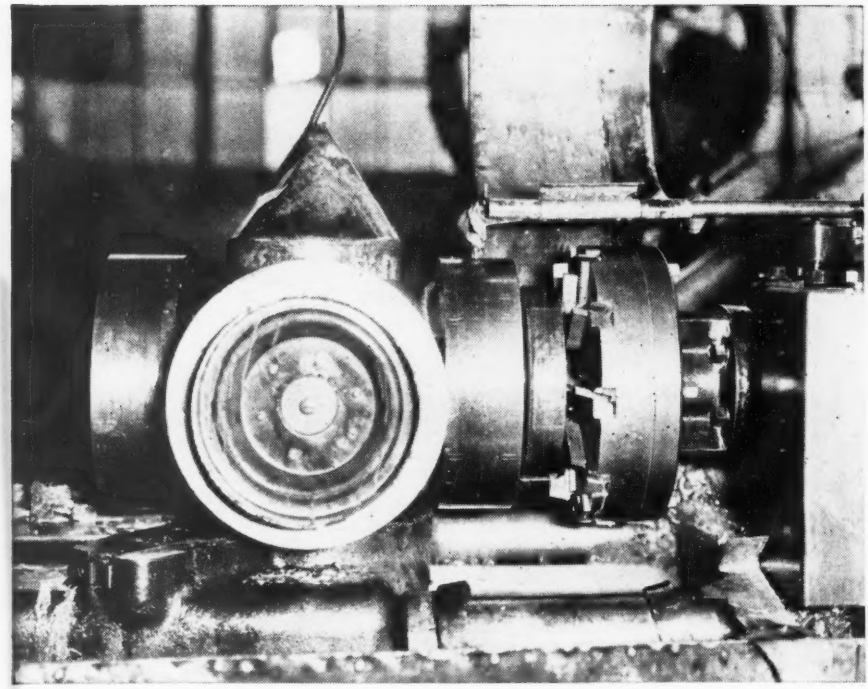
EX-CELL-O *for* PRECISION

EX-CELL-O

CORPORATION

DETROIT 32, MICHIGAN

50-5



Here are four rugged WALKER Magnetic Chucks on a Potter & Johnston Turret Lathe performing at a great saving. *Study it.*

WALKER CHUCKS for over a half century have produced *savings* by reducing hand time, worker fatigue, increasing production. Walker design utilizes the full power of magnetism that has been in existence since the beginning of Time.

THERE IS NOTHING NEW ABOUT IT. As *the* original designer of Magnetic Chucks, Walker is qualified to engineer your guaranteed savings.

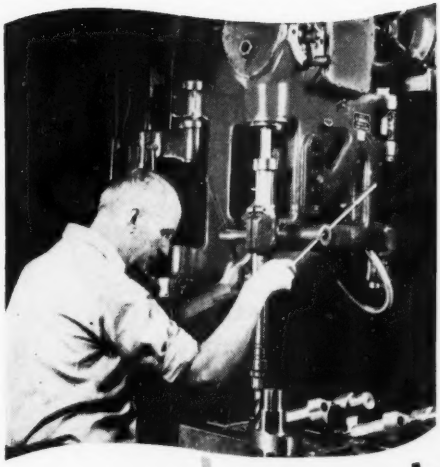
WALKER Engineering at your disposal—call Worcester 6-6293.

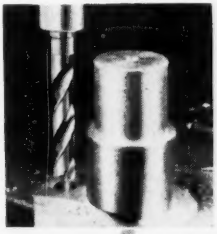
THE ORIGINAL DESIGNERS OF MAGNETIC CHUCKS

O. S. WALKER CO. Inc.

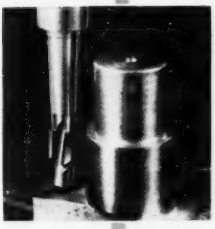
WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

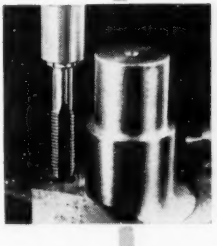




a radial drill that handles work *FAST*

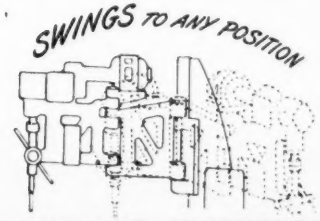


Speed and ease of operation is the big feature of Footburt-Hammond Radial Drilling Machines. The unique hinged bracket construction makes it possible to swing the drill head quickly from hole to hole. And the wide range of speeds is instantly available to take care of small or large tools. Tapping reverse is electrically operated by means of a separate hand lever; no additional adjustments required when changing for drilling to tapping. In-the-line operations may be handled faster with the handy machine.



THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building



FOOTBURT-HAMMOND

A TIME TESTED LINE OF MACHINE TOOLS

radial **DRILLING MACHINES**

Bokum Boring Tools are the accepted cutting tools wherever smooth, clean precision boring is demanded. These single-point tools have a distinctive helical and radial relief that maintains a constant clearance angle throughout the life of the tool. Resharpening is confined to one face. Finish lapped cutting surfaces produce better bores with faster feeds. Down time for regrinding is reduced.

Ask about these efficient tools. For super high speed, get catalog B1139-6; for carbide-tipped tools, B398; for solid tungsten carbide, B948; for resharpening fixture, B-AB-1; for tool holders, B-BT-24.

TRADE MARK REG. U. S. PAT. OFF

BOKUM TOOL CO.

14775 WILDEMERE AVE. · DETROIT 21, MICH.

SINGLE POINT BORING TOOLS—INTERNAL THREADING, BOTTOMING AND FACING TOOLS—CARBIDE TIPPED TOOLS

Seventh in a series of Unusual Grinding Wheel Operations

"Grinding Wheel Serves Tennis Ball"

The problem of removing flash that forms in molding tennis balls is solved by the use of grinding wheels.

This unusual operation may not be suited to your particular requirements but, WHATEVER your grinding problems may be, BAY STATE can help you solve them . . . fast. Possibly the exact specifications you require can be supplied directly from large stocks either in Westboro, branch warehouses, or from our distributors strategically located throughout the United States.

Send us your grinding problems. We can help you.

Photograph Courtesy of A. G. Spalding & Bros., Inc.

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Massachusetts, U. S. A.

Branch Offices and Warehouses
Chicago, Cleveland, Detroit, Pittsburgh
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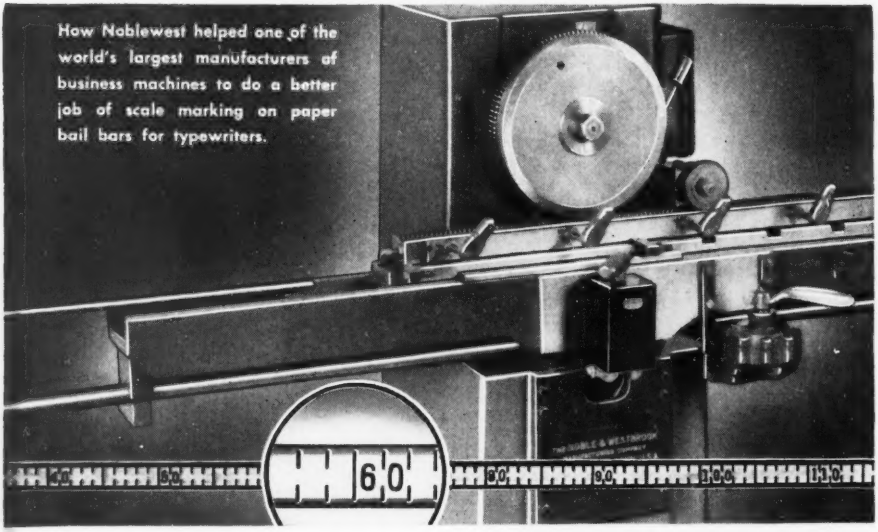
BAY STATE®

MEMBER OF THE GRINDING WHEEL INSTITUTE

Top Performance Consistently Duplicated

LEADERS IN INDUSTRY MARK WITH NOBLEWEST


How Noblewest helped one of the world's largest manufacturers of business machines to do a better job of scale marking on paper bail bars for typewriters.
60

Model No. 306

production graduating

at

300 linear inches per minute

This Noblewest precision graduating equipment roll-marks graduations into bar stock in lengths up to 3-feet at the high production rate of 300 linear inches per minute . . . does it better . . . and at lower cost than methods previously used. It is another example of how Noblewest Modern Marking Methods result in savings that often pay for the equipment within a year.

It can be used for marking other long bars, measuring scales, scale beams, etc. It employs the famous Noblewest roll-marking process, where marking is accomplished by single point contact between the roll-marking die and the work piece. Pneumatic Pressure Compensator controls depth of inscription as well as compensates for slight variations in stock thicknesses or surface irregularities. For information on how to mark your products faster, better, at lower cost, write the Noble & Westbrook Mfg. Co., 25 Westbrook Street, East Hartford 8, Conn.

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

TUKON for Micro-Indentation Hardness Testing

Wilson now offers 3 models for use with either Knoop or 136° Diamond Pyramid Indenter.

Model MO—Mechanically operated—simple, economical. Bench or floor type. Applies loads from 1 to 1000 grams.

Model FB—Fully automatic—most popular model. Applies loads from 10 to 3600 grams.

Model LR—"Long Range" model—the ultimate in hardness testing. Applies loads from 10 to 50,000 grams.

SEND FOR BULLETIN OF INFORMATION

Made by WILSON, manufacturer of "ROCKWELL" Hardness Testers and "ROCKWELL" Superficial Hardness Testers.

Model FB

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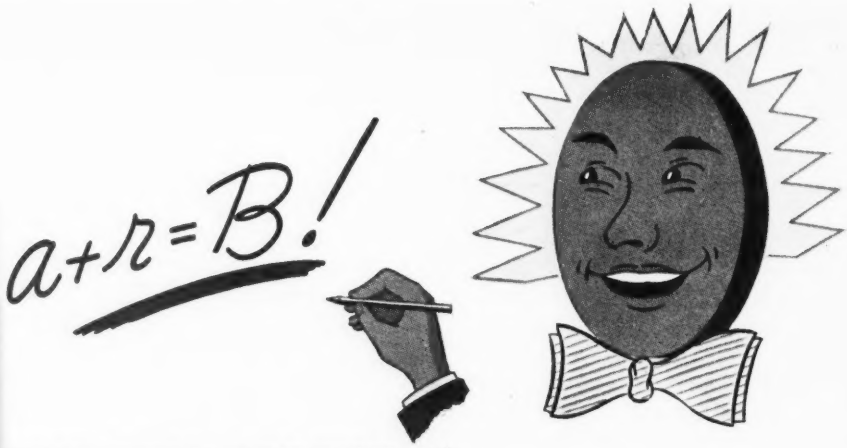

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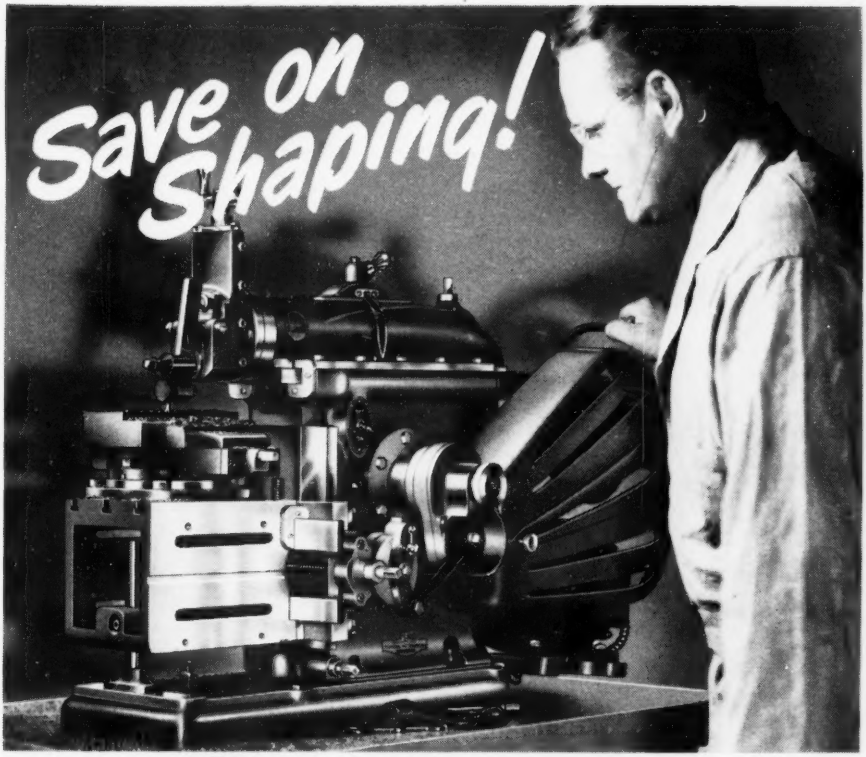

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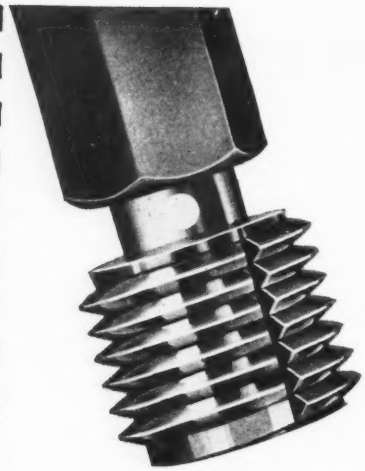

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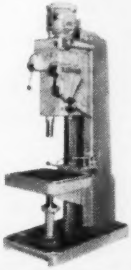
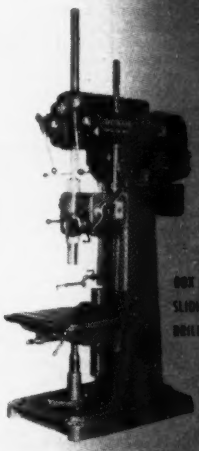


#325 SINGLE UNIT SLIDING HEAD DRILLING MACHINE



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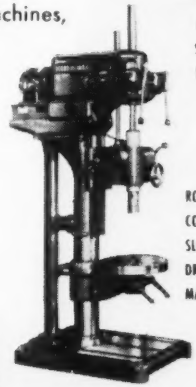
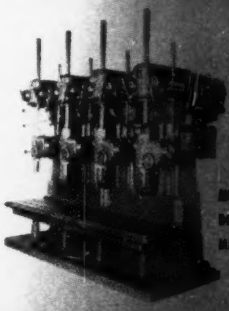


ROUND COLUMN SLIDING HEAD DRILLING MACHINE



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BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

Only MARVEL *builds all four**

***HACK SAWING MACHINES**

***BAND SAWING MACHINES**

***BAND SAW BLADES**

***HACK SAW BLADES**

While it is true there are several builders of hack sawing machines and many builders of band sawing machines, only MARVEL builds *BOTH* hack saws and band saws. The fact is that MARVEL manufactures 35 models of 10 basic types of metal sawing machines which include the world's fastest automatic production saw, the world's largest giant hydraulic hack saws, the world's most versatile band saw and the most widely used small shop saws.

With intimate and broad field experience in all types of metal cutting-off equipment and 35 different saws available, it is obvious that MARVEL Field Engineers occupy a unique and exclusive position in the industry. They are eminently qualified to make expert and *unbiased* recommendations covering the type, size and model of metal sawing equipment best suited to individual requirements—the most efficient, most accurate, fastest, broadest in scope and the most economical.

MARVEL is also the only manufacturer of both metal sawing *machines* and metal sawing *blades*. Because the efficiencies of both the machine and the blades are interdependent, each upon the capability of the other, expert knowledge covering both saws and saw blades is essential to the proper appraisal of any specific sawing situation. Correct balance of cutting speed and blade life, feed pressure and blade tension are all potent factors in over-all performance. Here again it is the MARVEL Field Engineer who is qualified to provide the comprehensive answer to your question. His job is to help you saw metal most efficiently—his services are available upon request—gratis.

Write for Catalog 49

ARMSTRONG-BLUM MFG. CO.
5700 Bloomingdale Ave., Chicago 39, U.S.A.

MODERN
Machine Shop

MARCH, 1950 • Vol. 22, No. 10

FEATURES IN THIS ISSUE

Aircraft Accessory Production Demands Ultra-Precision *By Gilbert C. Close*

During a tour of the AiResearch plant in Los Angeles, Gil Close found a number of interesting machining operations on which unusually high standards of accuracy are required. These operations form the basis of this article. Page 70.

Maintaining Mechanical Equipment *By Sigurd K. Rudorf*

Using the maintenance of mechanical equipment as a basis of an industrial safety study, Mr. Rudorf cites several case histories in which safer working conditions have been obtained in the Allis-Chalmers plant. Page 72.

Machining Parts for Fireball Engines *By Herbert Chase*

Mr. Chase provides the reader with a closeup view of several production operations on Buick Fireball engines. Of particular interest is the special tooling which is required to meet increased production requirements. Page 110.

Analyzing Blank and Scrap Strip Developments *By C. W. Hinman*

In this article, the author describes a step-by-step procedure which must be followed in order to accurately compute the area of blanks, lay out scrap strips, and lay out die blocks. Page 126.

Sales Hints for the Smaller Shop *By Karl F. Kirchhofer*

A discussion on the use of direct mail as a media designed to help the small shop owner obtain additional business. Page 144.

Geiger Counter Employed in Steel Analysis Method

A description of one of the most recently developed devices designed for the non-destructive testing of metal parts. Page 156.

A Practical Guide to Steel Selection *By Norman N. Brown*

Those who are confronted with the problem of selecting the right kind of steel for a particular job will find Mr. Brown's suggestions to be of utmost value. Page 166.

The Challenge of Science and Technology to Management *By L. A. DuBridge*

Dr. DuBridge offers the challenge to management to continue research in applied science in order to reap the maximum possible dividends in practical benefits from scientific discoveries already made and also to continue high quality work in pure science. Page 248.

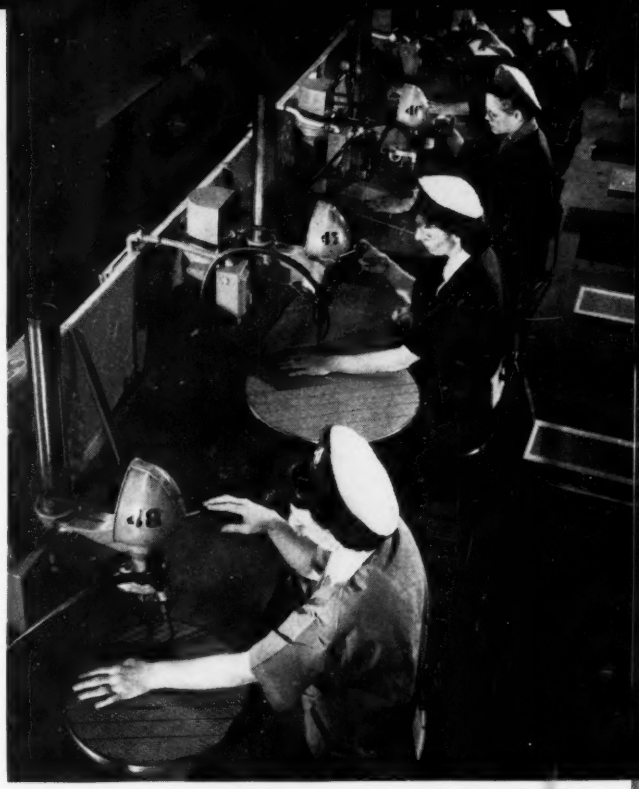
Aircraft Accessory Production Demands Ultra-Precision

In which the author describes high-precision tooling involved in AiResearch machining operations

By Gilbert C. Close

ONE of the country's leading writers recently described AiResearch Manufacturing Company, Los Angeles, California, as "a business built out of thin air." There is ample basis for this discerning description. Ninety-nine per cent of the company's efforts are directed toward the design, development and production of air control equipment for fast, high-flying air-

General view of the sheet metal department. This department is tooled for handling such various materials as aluminum, magnesium, plastics, beryllium copper, brass, Fiberglas, silicone fiber, sheet rubber, and so on. Several large impact extrusion machines are available for producing small aluminum turbine parts.



Skilled workers burring and reaming header plates for oil coolers. These workers operate the bench drills with the speed of an expert typist. Less than a half hour is required to complete the 6000 operations on each header plate.

planes. This company maintains the largest research laboratories in the world devoted almost exclusively to air control problems. Nearly all large modern airplanes, both military and commercial, are equipped with AiResearch products.

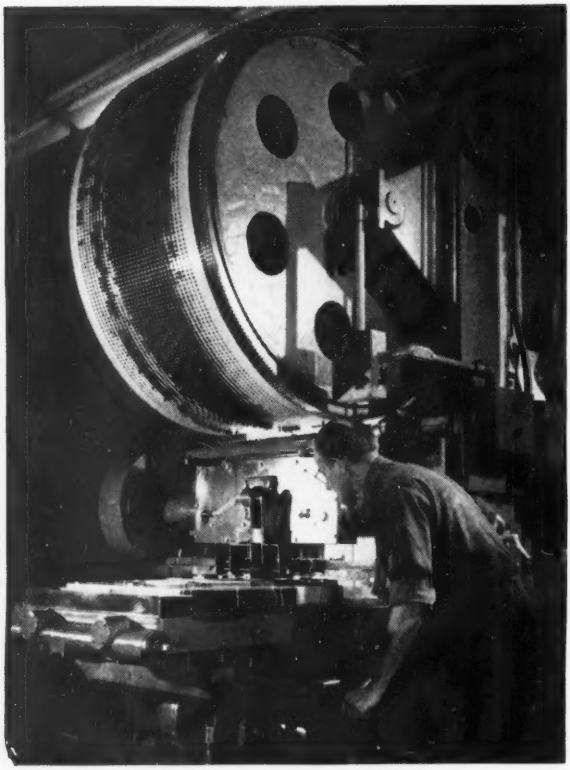
This is a highly specialized business from both the technical and production standpoints. Product design is largely pioneer development work. Design engineers must start from scratch, developing the product, the theory of its operation and its practical applications simultaneously. In many cases there is no previous similar product on which to base the nucleus of an idea.

Other complications, especially from the production standpoint, are induced by the fact that once a product is developed there will be a limited demand for its use, based on the relatively small unit production of the aircraft industry. Certain products will find use in only one type of airplane, such as the small air expansion turbine used to cool the cockpit on jet fighter planes.

Physical division of the company's floor space and the status of its some 1850 employees is sharply indicative of this specialized, small unit production. About 30 per cent of the available 230,000 square feet of floor space is given over to engineering and laboratory facilities, and more than 20 per cent of all employees are engineers, scientists, or laboratory personnel.

"We're more like a huge metal tailoring shop than a manufacturing industry," one executive pointed out. "Nearly all of our products are hand-tailored to fulfill a specific aircraft need. We're currently producing about 350 different assemblies with variations of many."

As an example of products, the small jet airplane cockpit cooling turbine mentioned above turns upward to 100,000 r.p.m's a minute. The turbine wheel in this assembly is produced on a three dimensional duplicating machine, and manufacturing tolerances are held to within 0.0001 inch. The wheel is then balanced in an electronic dynamic balancing machine. Side-to-side variations induced by vibrational distortion are adjusted to within 5 millionths of an inch. An oscilloscope denotes unbalance of the wheel, and a



This company - modified drill press is designed to drill 2000 holes a minute when operating at full capacity. The huge drum rotates the circumferential center-to-center hole distance between each press stroke. Stop buttons mounted in the tapped holes according to a pre-determined pattern drill this pattern in a heat exchanger header plate.

synchronized stroboscopic lamp is used to locate the unbalance. Excess metal is then removed with the aid of a precision carbide cutting tool.

The 350 products currently in production fall into five main categories: (1) aircraft heat transfer equipment; (2) aircraft electrical and electronic control equipment; (3) cabin pressure controls and superchargers; (4) aircraft air cooling turbines; and (5) auxiliary gas turbines and air starters. Common manufacturing tolerances in this type of work are in the order of 0.0005 inch, with many tolerances being held within 0.0001 inch. "Some of our tolerances are 50 times closer than those used in the finest watches," one engineer pointed out.

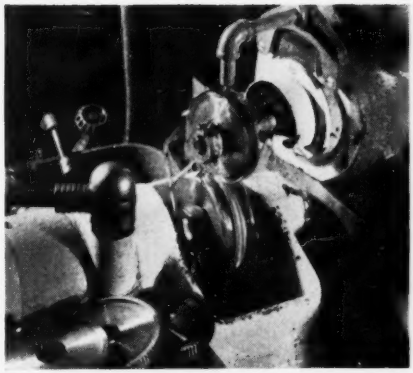
The machine shops at AiResearch are geared to this varied precision production. Except in a few cases, large automatic machines are purposely avoided as production runs are too limited to justify their use. Instead, conventional high precision tooling is employed that can be modified at will to meet various production requirements. These machines are operated by the best machinists and skilled craftsmen the company can secure. Wage standards are well above the average in the industry. "We've found that good men and good machines are a necessary combination in precision production," it was pointed out.

Production flexibility is indicated by the major tooling facilities. There are 38 engine lathes available, ranging from 9 inches to 16 x 54 inches in size, and 27 turret lathes from size No. 1 through size No. 4. One hundred four grinders include 9 surface, 1 internal, 1 hole, 4 thread, 3 Universals, 2 centerless, 1 gear, 1 tool and 82 bench types. Nineteen milling machines, 35 presses, 7 duplicators, 34 furnaces, 30 varied saws, 13 comparators, and 130 spindle drill presses are included in the more

than 650 major machines manned by a total of less than 150 employees.

The products nearest approaching mass production volume are the some 75 types of all-aluminum heat exchangers used for air-oil coolers, fuel-oil coolers, intercoolers, exhaust heat exchangers, cabin heating and cooling, and so on. The all-alumium heat exchanger was originally designed and developed at AiResearch and resulted in considerable weight-saving over previous brass exchangers. In principle, these heat exchanges consist of numerous small aluminum tubes mounted vertically between drilled aluminum header plates, and enclosed in an aluminum body or "stack", thus providing tremendous surface area for cooling or heating of the gaseous medium flowing through the tubes.

Due to the volume involved and the similarity in the component parts of the various heat exchangers, most of the company's "unsual" and automatic tooling is concentrated on this type of work. One machine, a modified drill press used in drilling the holes in header plates, is particularly interesting.



Grinding a small turbine gear to a tolerance within 0.0001 inch.

General view of the foundry department. Both sand and centrifugal methods are used. Casting metal is chemically analyzed prior to use. About 80 different parts are produced, including small motor rotors, turbine wheels, and supercharger impellers.

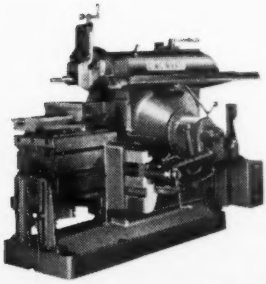
Checking a casting. Flatness and parallelism is held wihtin 0.005 inch.

Company tooling engineers equipped this press with a huge drum, approximately 4 feet in diameter and 2 feet wide. The drum is perforated with numerous aligned and tapped holes in which the stop buttons that act against the drill shank are installed. The drum rotates a given amount each time the press bed moves, bringing a new row of stop buttons into position above the drill shanks. When the drum descends during the press stroke, only those drills directly under drum holes in which a stop button is installed will be actuated. The stop buttons are installed in the drum according to pre-determined layout, and the pattern of drilled holes in the header plate will correspond accordingly. With all stop buttons in place, the machine can drill 2000 holes a minute. About 80 header plate drill hole patterns are produced on this equipment.

The aluminum tubes for the heat exchangers, about ¼ inch in diameter, are produced in the AiResearch shops by the only similar aluminum extrusion presses west of the Rockies. Solid ½-inch aluminum bar stock, three bars at a time, is first cut into ½-inch long slugs on a shear-equipped press. The slugs are then barrel-deburred,

Assembling small electrically-driven aircraft actuator units. Precision exceeding that of the finest watches is maintained in such units.

Shaping a BIG job...



Internal shaping bearing seats in this 5500-lb. steel plate to a tolerance of .001 indicates the accuracy and rigidity of Cincinnati Shapers.

The rapid and accurate metal removal, and the low-cost setup for shaping this 12′ steel plate on the sturdy Cincinnati table, give low-cost operation.

The unusual flexibility of change from job to job in minimum time and with minimum costs of tooling and fixtures also has made the Cincinnati Shaper the handy man of industry.

A versatile Cincinnati Shaper will be a busy and profitable machine in your shop.

Write for Catalog N-5 for detailed description of the types and sizes of Cincinnati Shapers.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Mounting pressure bellows in a cabin pressure regulator.

then indented on one end in another press equipped with indenting dies. The "indent" acts as a guide for the tip mandrel on the extrusion die in the extrusion press.

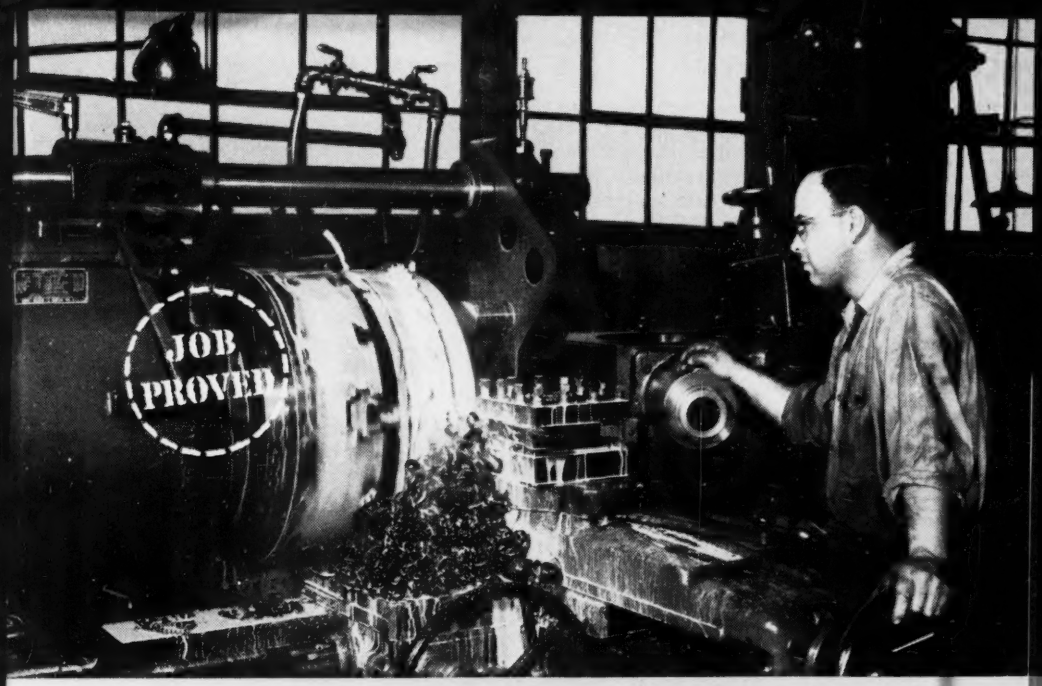
The indented slugs are then fed automatically into a 110-ton press equipped with extrusion dies. A single press stroke produces a finished tube with a wall thickness that can be varied between 0.006 inch and 0.016 inch. More than 2 million tubes are extruded every month.

After extrusion, the tubes are automatically straightened, cut to the desired length, then both ends flared on an automatic flare press. After assembly of the tubes in the header plates, and installation of the exchanger unit in its stack, the entire assembly is brazed by a process developed at AiResearch and still regarded as a trade secret. The entire heat exchanger assembly is held within a tolerance range of 0.003 inch. This alone is a remarkable technical achievement considering the number of parts involved, the nature of a sheet metal assembly, and the fact that a relatively soft aluminum alloy is used.

The electric shop at AiResearch can hardly be said to be on a mass production basis despite the number of devices produced. This is because of the great variety of products which constitute the production total. The shop produces more than 200 different AC and DC motor-driven electric actuators, in addition to many AC and DC motors for use in thermostatic temperature sensing controls. electric and electronic airplane flap control systems, electronic regulators, ammunition boosters, and so on.

AC motors rangings from 4 thousandths to 3 hp, and DC motors ranging from 5 ten-thousandths to 15 hp are produced. One ⅛ hp motor, used in a Boeing B-50 bomber actuator, is geared to handle a 3100 pound load. Other small motors operate at up to 40,000 rpm.

Special new-type motor winding machines are used for winding armatures. One of these machines will spin No. 36 copper wire onto an armature at a greater production rate than can be accomplished by 10 skilled hand wind-



S.E.C.O. BEATS COSTLIER CUTTING OIL

Competitive Product Fails to Match Fine Record of Sunoco Emulsifying Cutting Oil in Cost or Performance

For 27 years a metalworking shop used Sunoco Emulsifying Cutting Oil with complete satisfaction. Tool life was excellent and machines stayed clean. High production, with minimum scrap, was the rule year in and year out.

The following is typical of the difficult operations in which the Sun product was successful for so long.

Machine: Gisholt turret lathe, model 4L.
Part: 20" press mold shell 22⅛" O.D. x 6" wide x 20½" I.D.
Operation: Turning and boring rough forgings.
Materials: 40-50 carbon steel.
Tools: Firthite carbide tools.
Feed: .012 at 31 rpm.
Cut: ½" to ¾" on O.D. and boring.

Two years ago the shop was persuaded to try a competitive oil on the above operation. Test results showed that the competitive oil, costing three times as much, lacked stability. Performance was far inferior to that of Sunoco Emulsifying Cutting Oil in regard to tool life and quality of finish. The company was convinced the original choice had been sound.

In all machine shop operations, on both ferrous and nonferrous metals, you'll find Sunoco Emulsifying Cutting Oil and Sunicut straight cutting oils of real assistance. They help maintain production schedules, lengthen tool life, and keep operating costs down. For a free Sun cutting oil recommendation card, write Dept. MM3.

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ers. Some motor rotors are machined; others are produced in the company's precision casting department.

In the casting of various motor and turbine parts, both the sand and centrifugal methods are used. Precision is the byword here as it is elsewhere in the shops. All casting metal is chemically analyzed prior to use, and core sand is carefully weighed and measured, then electrically baked.

100,000 rpm are produced by profiling on two-or three-dimensional duplicating machines. Tolerances within 0.0001 inch are maintained. The flexibility of the duplicators in this type of work is a distinct asset due to the variety of wheels and impellers needed.

Other shop departments, generalizing in work on all products, exhibit the common denominator of flexibility regardless of the type of work accomp-

Testing cabin pressure regulators in a special vacuum chamber. All production testing is carried out with laboratory precision.

More than 80 different types of castings, including body castings, air turbine, gas turbine and supercharger impellers, and motor rotors are produced.

Larger high speed rotating parts for turbines and superchargers are produced by extrusion forging. After heating of the pre-sized aluminum slug, the parts are forged with a single blow in a large press. Subsequent machining, except for drilling, is limited to metal removed during dynamic balancing.

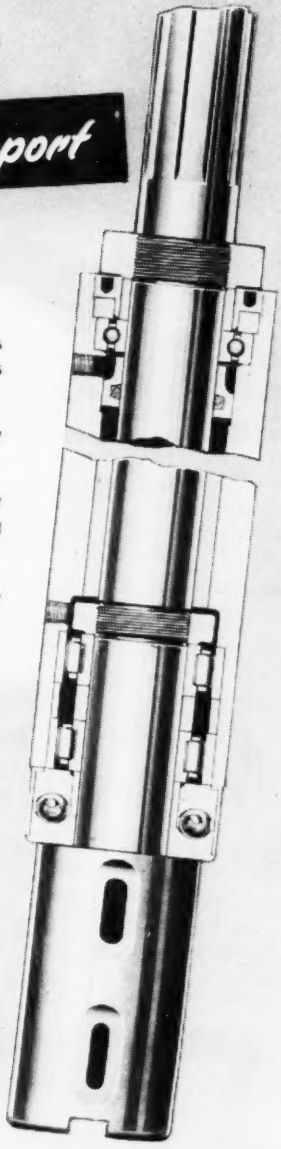
Most of the smaller very high speed turbine wheels operating upward to

lished. The welding department for instance, contains 9 arc, 5 spot, 1 seam, 1 butt, and 2 progressive welding machines. Thirty-four furnaces ranging from 2½ KW to 105KW in size are located throughout the shop. Three pedestal and 10 bench-type comparators with magnifications as high as 62.5 are available for inspecting and checking threads, gear contour, and other small machine parts. Multiple drills available range upward to 51 spindles.

Due to the very high precision requirements, there is no sharp demarca-

Unusual Tool Capacity

Unusual Spindle Support

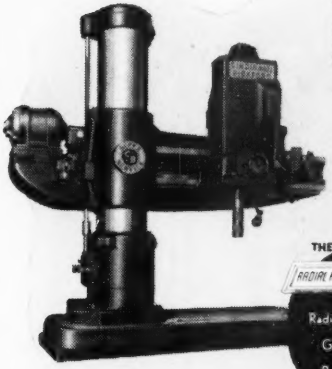


What is full spindle support? What does it accomplish? It's rigid support against thrust and radial load—at ALL positions of the spindle.

In performance, it means accurate, smooth power delivery and long, trouble-free operation.

The multiple spline driven Cincinnati Bickford Super Service Spindle—with its large thrust bearing and its special sliding sleeve—never feeds away from its bearings.

This modern, up-to-date design, with 36 speeds and 18 feeds, also gives a maximum tool capacity for any given size.



Write for Circular R-29 for details of construction of this Cincinnati Bickford Super Service Radial Drill.

This machine is furnished in sizes 11" to 19" diameter column, 3' to 8½' arm.

THE CINCINNATI BICKFORD TOOL CO.

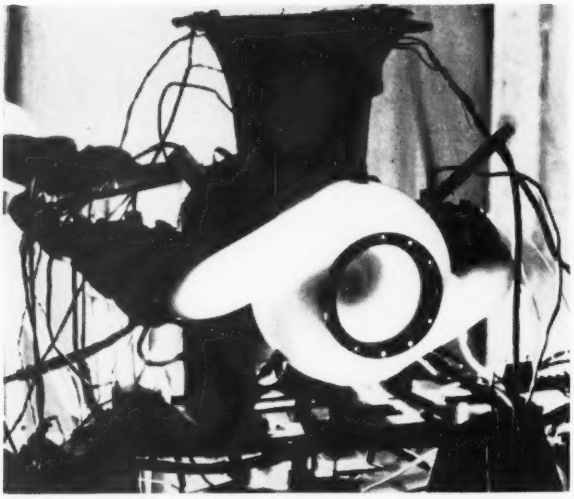
RADIAL AND UPRIGHT DRILLING MACHINES

SUPER SERVICE

Radials 7½" dia. col., 2½' arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

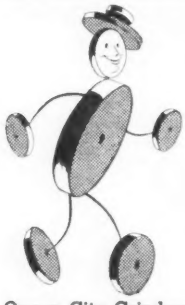


A small gas turbine under test. Temperatures exceed 1600 degrees F. and the turbin wheel is spinning 40,000 rpm.

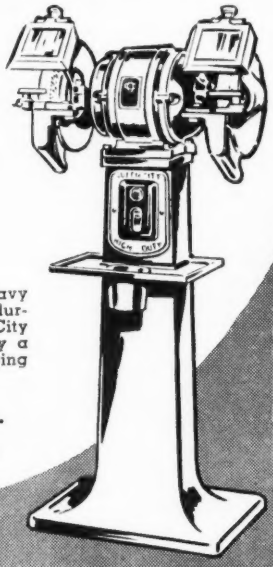
tion at AiResearch between shop and laboratory work. Inspection and testing of shop-produced equipment is carried out with laboratory precision.

In many cases the same machines and equipment used in pure research will be used for testing production-run products.

One such example is the sunken, wood-lined whirl pit. In this pit, parts may be whirled until they are torn apart by centrifugal force. Other parts are production tested at rotative speeds upward to 160,000 rpm's. When parts break at this speed, the fragments fly outward with the speed and deadly in-



Cut grinding costs . . . with rugged QUEEN CITY Grinders



Queen City Grinders are built to stand up under the heavy work that pours through the shop daily. Noted for their durability, freedom from downtime and low cost, Queen City Grinders cut grinding costs to the bone. • Order today a battery of these low cost grinders and eliminate "ganging up" around one lone grinder.

QUEEN CITY MACHINE TOOL CO

QUEEN CITY
Machine Tool Co.
223 E. 2nd St.
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May we EXPLODE an old theory on machining?

We refer to the idea that *no* water-soluble oil should be used as the cutting fluid in automatic screw machines. A few years ago we might have agreed with that—but not now! There is *one*—and one only—which we would now recommend for automatics. That is ANTISEP All-Purpose Base. Solutions of that modern concentrate are being used all over industry in automatics, because it is proving more than satisfactory from every angle—cooling ability, safety, finish and speed.

The reason is that Antisep A.P. Base isn't just another water-soluble cutting oil. It has established an entirely new concept in machining. Here is a base oil with high fatty content, anti-welding characteristics, high film strength and excellent lubricating qualities. It may be used for 90% of all machining jobs, and it costs, in solution, less than 7 cents a gallon!

May we cite you authentic instances of where and how Antisep Base is out-performing former types of cutting fluids in automatics? We believe you'll then agree that we've busted an old tradition wide open. E. F. Houghton & Co., 303 W. Lehigh Avenue, Phila. 33, Pa.

HOUGHTON

PRODUCTS FOR METAL WORKING

CUTTING OILS • QUENCHING OILS • HEAT TREATING SALTS • METAL CLEANERS
RUST PREVENTIVES • INHIBITORS • "FORTIFIED" LUBRICANTS • PACKINGS

(Above) Mounting a turbine wheel in the sunken whirl pit. (Below) Condition of wood-lined pit after part has been whirled to destruction. Rotational speeds up to 160,000 rpm are obtainable with this equipment.

tent of shrapnel projected by a military high explosive shell burst. The wooden pit lining cushions the impact of these parts and preserves them for subsequent examination.

Any description of production at AiResearch would be relatively lackluster without at least a brief resume of the gamut of laboratory test apparatus production parts must pass before they are accepted for use. The company maintains, for instance, a huge Stratolab in which it is possible to simulate pressurized flight conditions inside or outside an airplane from 1500 feet below sea level to a stratospheric 75,000 foot altitude. All cabin pressurizing equipment can thus be tested far beyond normal requirements at this time.

Another test chamber for supercharger testing will simulate a 25,000 foot altitude at 40 degrees F. below zero. Compressors for regulating the pressure in the altitude chambers are capable of handling 6800 cubic feet of air a minute.

"Torture" tests of every description are provided for spot checking shop production and parts. In one such test, fine desert sand is whipped with tornado force around an electrically driven actuator for 2000 hours. Another chamber provides 100 per cent relative humidity at 86 F. for 15-day test runs. This is far and above the most humid conditions encountered in the tropics.

A refrigerated wind tunnel operating at 75 degrees F. below zero is used for testing oil coolers and other heat

It's Here!

THE NEW LOGAN '955'

955 HAS CAPACITY

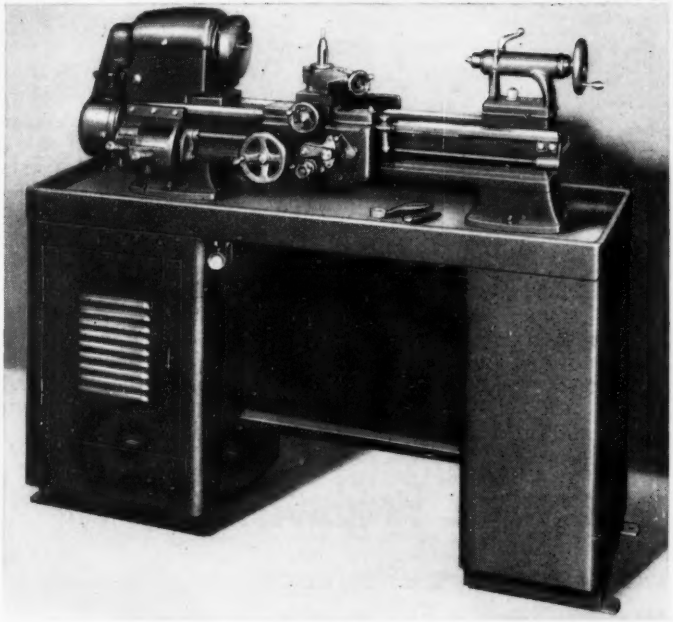
1" collet capacity, 11" swing, 1⅜" spindle hole, 24" between centers. (36" between centers also available.)

955 IS ACCURATE

Typical tolerance: less than .0005" total run-out of spindle 12" from bearing. Bed ways precision ground to within .0005" variation.

955 IS DURABLE

Extra rugged in construction. Self lubricating bronze bearings protect vital wear points.



A NEW HIGH IN VALUE

The 955 has all specifications and tolerances of lathes selling at up to $1,000. Here is a lathe with the sustained accuracy, the versatility, the speed and the ruggedness that industry expects of Logan design. Here is a lathe with the capacity to handle the majority of metal turning jobs. Here is a pedestal base with underneath drive that keeps moving parts enclosed yet accessible, saves space in multiple installations or single installations, and simplifies cleaning. Here is a saving in price that is true thrift because it entails no sacrifice in quality. Here, in brief, is the *new* Logan combination of quality, low price, and low-cost performance that makes the 955 the lathe to buy today. See the 955 on display at your nearby Logan Lathe Dealer's, or write for the new 955 Folder.

Only $585.00 F.O.B. CHICAGO

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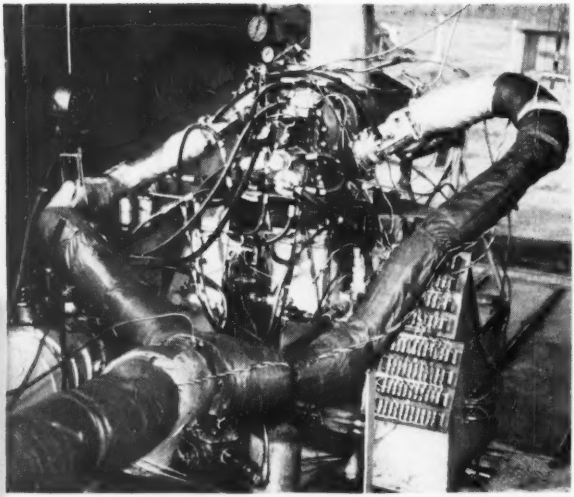
LOOK TO *Logan* FOR BETTER LATHES AND SHAPERS



This illustration of test apparatus connected to a gas turbine during a test run is evidence of the extremes to which precision is carried out. The turbine itself is all but concealed by the hundreds of pressure tubes, thermocouples, wires, and so on, leading to various recording instruments.

exchanger equipment. Another device blasts 100 octane gasoline at 1,900,000 foot pounds of energy around operating electric motors to determine whether or not the actuator is emitting an explosive spark. Under this pressure, the gasoline vapor will penetrate the innermost parts of high speed motors.

To anyone not acquainted with the aircraft industry, such extremes of precision manufacture and such brutal

To Increase Production

and to improve efficiency use Butterfly Filing and Die Making Machine

This is a powerful machine, for heavy or small precision work in use all over the world: Airplane Factories, Ammunition Plants, Toolrooms where fast production is desired. 4 Models, No. 16, No. 14, "EL" and Model "D". The larger the model, the larger the stroke and therefore more filing is performed, furnished with or without pedestals.

Constructed as per Specifications of U.S. Naval Aircraft Factories.

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Our Machine Carries the Butterfly trade mark.

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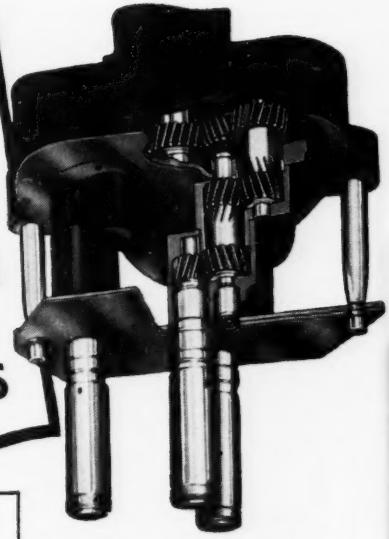
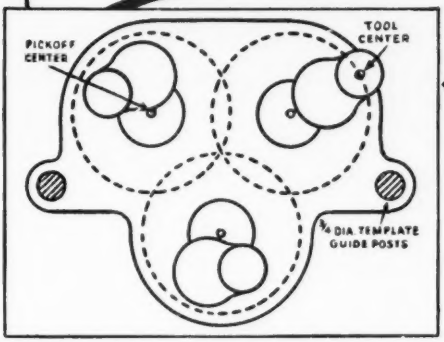
CUT YOUR COSTS
with
Multiple Drilling, Tapping, and Boring
Use WISCONSIN *Kwick-Change* Multiple Adjustable DRILL HEADS

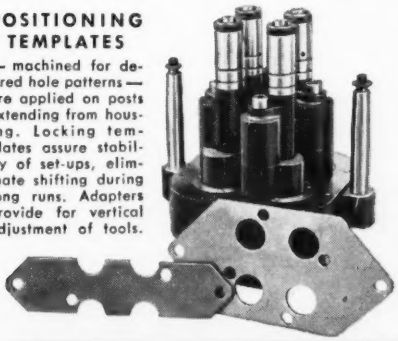




This is Why!

Only WISCONSIN Kwick-Change Multiple heads permit locating drill point anywhere within area of intersecting circles. There are no "blind spots" inside these circles. Spindle housings are sleeved with *two centers* of adjustment. Each spindle swings around one center which also may be rotated around another center. Diagram at left shows how this feature permits tool point to be located at any point within area of large circle.

POSITIONING TEMPLATES — machined for desired hole patterns — are applied on posts extending from housing. Locking templates assure stability of set-ups, eliminate shifting during long runs. Adapters provide for vertical adjustment of tools.



WISCONSIN Kwick-Change Multiple Adjustable Drill Heads are available with two to eight spindles, and in a complete range of capacities from "Light Duty" to "Extra Heavy Duty", in standard models. Heads with more than eight spindles built to special order. Positioning and Locking Templates are specially machined for as many *hole patterns* as required.

Write for Literature and Data Sheets.

WISCONSIN DRILL HEAD CO.

Sales Representatives in Principal Cities.

BUTLER, WISCONSIN

CHICAGO STEEL PRESS BRAKE

Model No. 131

A new member of the Chicago Press Brake family designed to supplement the larger machines.

Within its rated capacity (11 tons) all operations are handled same as on the larger machines.

All steel construction, enclosed gearing.

Takes up small floor space.

We can make excellent deliveries of this new press.

We make complete line of dies for all Press Brakes.

●

Send for Bulletin 131 for further description

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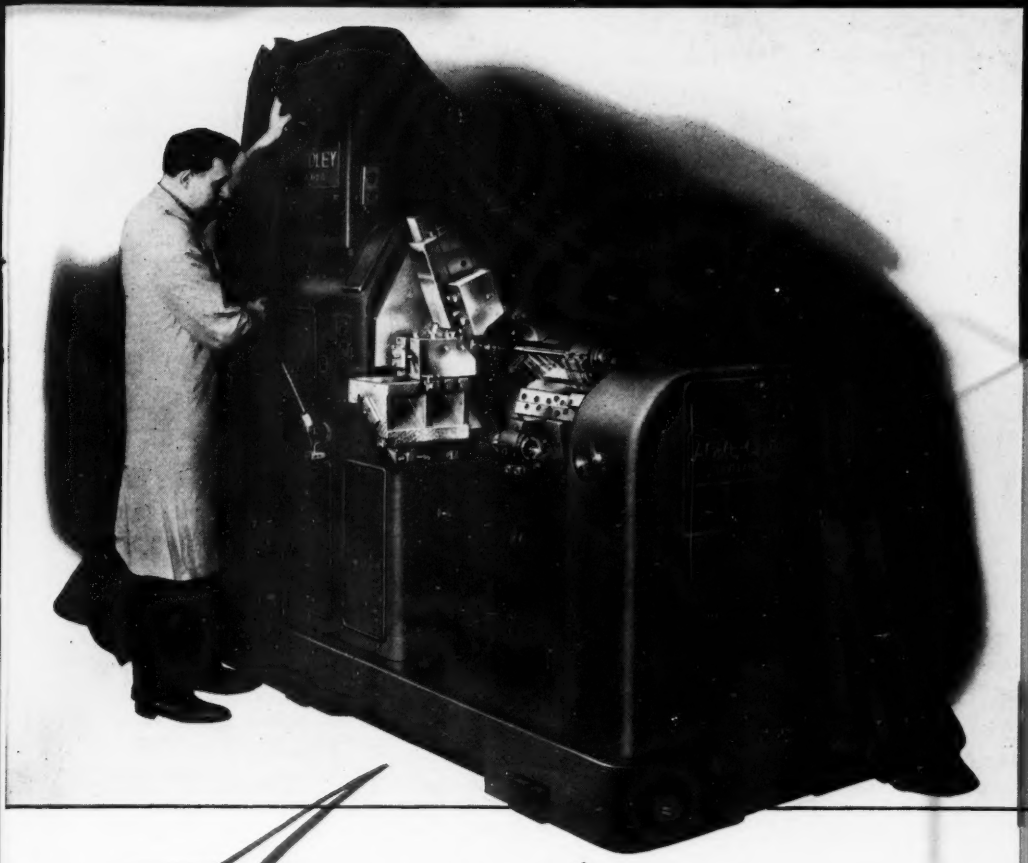
testing may seem a bit on the exaggerated side. But when it is emphasized that sudden failure of any one of many AiResearch products could cause the loss of a million dollar airplane with passengers and crew, such precise methods assume real and necessary proportions.

Design work at AiResearch is largely creative. Many products pass directly from the creative phase into service applications, minus a backlog of successful operation achieved by similar products. Precision and exhaustive testing are the two principal devices employed by AiResearch engineers to bridge the often dangerous gap between creative development and practical service. And in this particular case, it is the nettle-edged skill emphasized in the company's various shop divisions that make employment of these two devices possible.

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.

"M-M-M—Nice! But I'll Bet the Maintenance Runs High!"



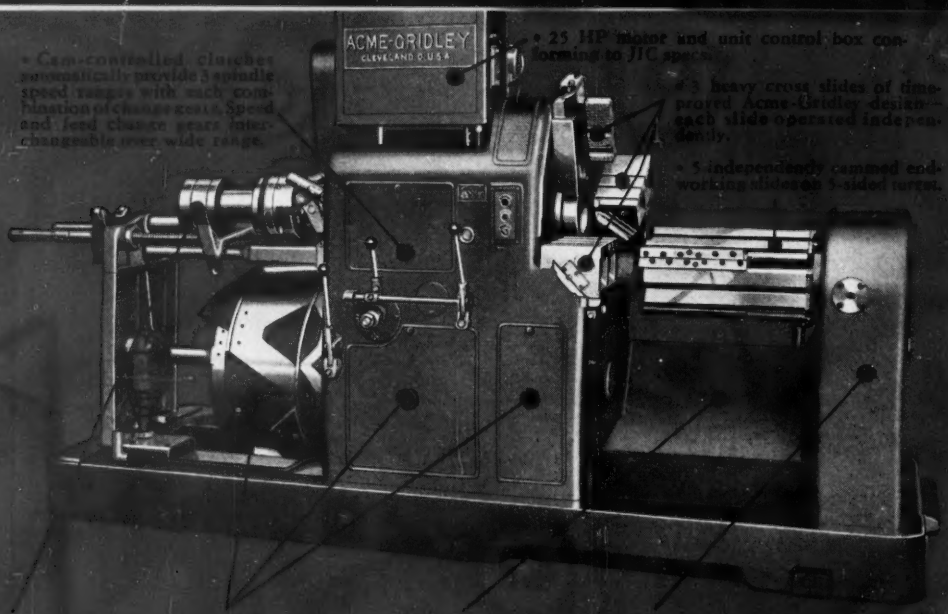
Announcing

THE FASTEST . . . MOST ECONOMICAL

SINGLE SPINDLE BAR AUTOMATIC

IN SIZES 2⅝", 3½", 4¾" AND 5⅛"

For details turn page



• Cam-controlled clutches automatically provide 5 spindle speed ranges with each combination of change gears. Speed and feed change gears interchangeable over wide range.

• 25 HP motor and unit control box conforming to JIC specs.

• 3 heavy cross slides of time-proved Acme-Gridley design—each slide operated independently.

• 5 independently cammed end-working slides on 5-sided turret.

• Positive, cam-controlled chucking mechanism and stock-stop.

• Speed cams, easily accessible—require minimum change for any range of similar work.

• Wide, open tooling area with plenty of chip room—chip conveyor optional.

• Rugged outer turret support houses Geneva mechanism with separate motor for indexing turret independently of cross slide operation.

THE NEW ACME-GRIDLEY
MODEL "M" SINGLE SPINDLE BAR AUTOMATIC

offers . . .

★ **SPEED**—Production up to 10 times faster—by actual test on customer jobs. Rugged doubly reinforced frame construction permits speeds and feeds required for carbide tooling.

★ **SIMPLICITY**—Fully automatic; wide, open tooling zone; simple camming; easy to tool, quick to retool—one man can operate several machines.

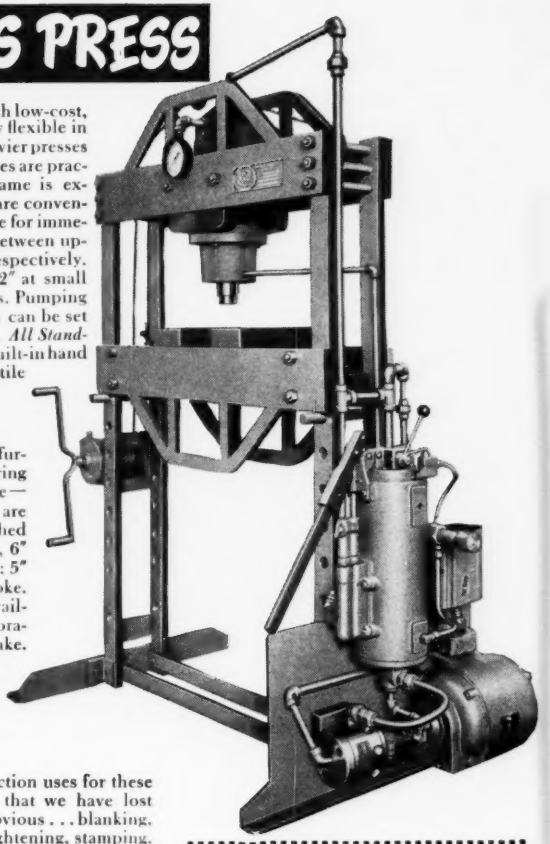
★ **ECONOMY**—Complete freedom from gadgets and unneeded accessories permits an economical base price—matched by new economies on short or long-run jobs.

★ **ACCURACY**—Sustained close tolerances and fine finish at the fastest feeds and highest spindle speeds, modern tools can take.

Write for new Catalog on Acme-Gridley Model "M" Single Spindle Automatic

THE NATIONAL ACME CO.
170 EAST 131 STREET · CLEVELAND 8, OHIO

LOOK AT THIS PRESS



It's designed to provide industry with low-cost, high production units that are highly flexible in design and operation...relieving heavier presses of short runs and lighter work. Presses are practically fool-proof in operation. Frame is extremely rugged. Fingertip controls are conveniently located at hand level. Available for immediate delivery, in standard width (between uprights) of 24″—31″—36″—42″ respectively. Available in special width up to 72″ at small additional cost. Movable bed plates. Pumping unit has by-pass relief valve which can be set at any pressure up to press capacity. *All Standard* presses equipped with 2-speed built-in hand pumps for more sensitive and versatile operation.

READ THESE "SPECS":

CYLINDERS: *Standard Models* furnished with 6″ bore, 7½″ stroke—spring return type; also 5″ bore, 7½″ stroke—spring return type. Above presses are *standard*. Following can be furnished at additional cost: Double Acting, 6″ bore, 7″ stroke; 6″ bore, 11″ stroke: 5″ bore, 7″ stroke; 5″ bore, 11″ stroke. Special long stroke cylinders also available, up to 48″ in length, for incorporation in suitable press frames of our make.
PUMPING UNITS: These units can be supplied in various volumes and pressures, in a total of 13 combinations.

CHECK THESE USES:

There are so many everyday production uses for these versatile KRW Hydraulic Presses that we have lost count. Here are a few of the more obvious . . . blanking, forming, bending, broaching, straightening, stamping, embossing, numbering, upsetting, laminating, pressing and hot or cold forging.

BEAT THESE PRICES*:

Depending upon capacity of pumping equipment, prices of Standard model motor driven hydraulic presses are as follows, F. O. B. Factory: 25-ton press from $727.00 to $992.00. 50-ton press from $806.00 to $1058.00. 60-ton press from $1070.50 to $1135.00. 75-ton press from $1198.00 to $1258.00. All motors in the above units are 220/440 volt, 3 phase, 60 cycle. Any change in motor specifications is extra.

**Subject to change without notice.*

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MAIL THIS COUPON

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Please send me complete information on K R W Motor Driven Presses as follows:

☐ 25-ton ☐ 50-ton ☐ 60-ton
☐ 75-ton presses ☐ Press Cap.
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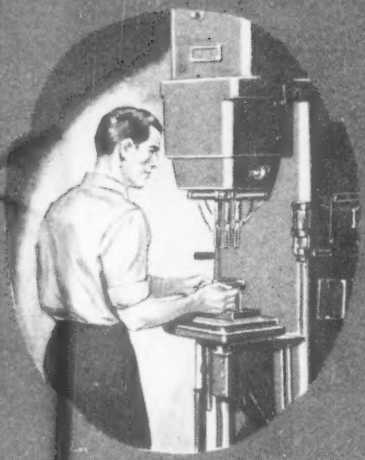
CORRECT USE OF



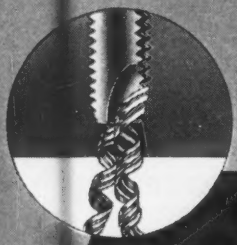
WINTER

CHIP DRIVER TAPS

One of the important problems on many high speed production tapping jobs is to get rid of the chips without choking the tap or scratching the completed thread.

Winter Balanced Action Chip Driver Taps (Spiral Point) do this successfully. The accurately ground and scientifically designed chip driver contours drive the chips ahead of the tap, so that no chip choking can occur. These taps are suitable for a wide variety of tapping operations, *but are not recommended for use in blind holes.*

Other Winter products include Precision Commercial and Cut Thread Taps of all common types, such as Four Flute, Three Flute, Machine Screw and Pipe Taps and many others.



ALWAYS AT YOUR SERVICE—YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.

WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company

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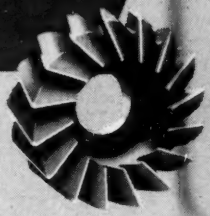
THE WIDE APPLICATION

NATIONAL END MILLS

A wide variety of milling operations that cannot be done by any other tool can be advantageously performed by end mills.
National End Mills are available in a great many types and sizes to meet these varied job requirements.
Shell End Mills, Heavy Duty Taper Shank End Mills, Helex End Mills in Single and Double End construction, small diameter Short Series End Mills and many others are available from stock.
National Engineers will recommend the best type for your application.
The complete National line also includes Twist Drills, Reamers, Counterbores, Milling Cutters, Hobs, and Special Tools.



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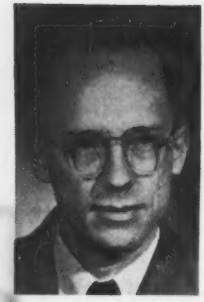


S. K. Rudorf

Maintaining Mechanical Equipment

Detailed inspection and close supervision pave way to safer working conditions

By Sigurd K. Rudorf

Superintendent, Maintenance and Tools Section, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

IN industrial safety, there are three major fronts of action: first, the supervisor must preach, and above all practice, safe methods; second, the employee must be in a frame of mind to accept safety teaching; third, while the foregoing are, in my opinion, more important than the actual subject of this discussion, the maintenance of mechanical equipment is the last, and of course also an important link, in our hypothetical three-point attack.

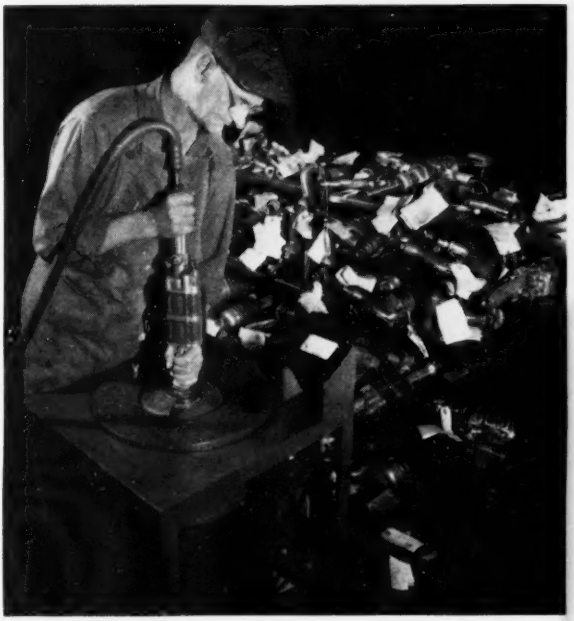
The functions of maintenance departments vary widely from plant to plant. Usually their work is not confined strictly to maintaining equipment. In the plant with which I am associated, maintenance involves such things as design, acquisition and distribution of machine tools, special tooling and plant equipment, as well as the customary millwright work, machine repairs, clerical functions, small tool purchase and distribution and even plant-wide sanitation.

Machinery and equipment are closely related to the building into which they are placed. A proper installation must consist of not only a suitable piece of equipment, but a suitable installation. Safety consciousness should not begin after an accident or a near miss. At the time the purchase order is written for a new piece of equipment, the safety angle should have been thoroughly examined.

Allis-Chalmers follows the practice of specifying on requests for quotations, and also on purchase orders for machines and equipment, that the item covered by the order must be guarded to meet the Wisconsin Industrial Commission Code.

We have frequently been asked and have willingly sent copies of the applicable codes to our machine tool suppliers. We have never encountered a flat refusal to furnish the machine suitably equipped. Only in one or two isolated cases have we incurred any extra charges as the result of this guarding.

Having thus purchased a safe piece of equipment, and having, upon its arrival at the plant, confirmed this condition through inspection by qualified personnel, the next major considera-



Before an air-operated hand grinder is issued to the workman, it is run up to full speed in the test stand shown here.

tion is the manner in which the equipment is installed. The installation must provide adequate lighting, and adequate space for the operator to do his work. There must be clearly defined places for incoming and outgoing material, and means must be provided for heavy machine accessories and tooling to be stored when not in use. Mounting such tooling on the machine when required must be possible without involving the operator in awkward positions or having him lift heavier loads than he can safely handle.

It is then necessary to examine the specific operation to be performed on the piece of equipment which has been installed. Because of the nature of the special tooling used, or the workpieces to be held, it may be necessary to provide additional guards or safety interlocks. It is necessary to establish certain standards which may be **more** rigid, but in no instance **less** rigid, than the applicable state code. Depending upon the size of the concern in question, such standards can be established either by means of written records and instructions, the administration of which might be the responsibility of a health and safety department, or in the case of small concerns, uniformity can often be secured by having the same person or persons do the inspecting in all instances. Practical experience indicates that the matter cannot be left to the judgment of a great number of individuals, since lack of uniformity will inevitably result.

We maintain machines for the purpose of protecting our investment; that is, we guard against **premature** wear and tear; we maintain it to assure uninterrupted productivity and safety to the employee.

For the purpose of this discussion we will concern ourselves only with the maintenance work performed in the direct interest of safety.

Every plant has certain operations and processes which are inherently dangerous. Yet experience tends to show that where these hazards are extreme, the safety precautions taken and the general awareness of the hazards are such that accidents seldom happen. It is not surprising that the most troublesome accidents are those which simply seem to happen without warning.

Let's discuss the case of an ordi-

A wrench has fallen from an overhead point narrowly missing an employee.

jecting the operator to unexpected forces as well as direct hazards from a shattering wheel. To top it all off, such a tool is easily misused. A wheel can be damaged by dropping the tool, by forcing it into the job, and it is rather easy for an unauthorized person to mount an

nary air-operated hand grinder.

Potentially this is quite a dangerous tool. It is operated by air at close to 100 pounds per square inch pressure, itself a potential hazard. It is fitted with a grinding wheel, which could be improperly mounted or clamped, resulting in shattering of the wheel at high speed. The tool itself operates at speeds which command respect. It is necessarily hand-held, sub-

Investigation brought to light the fact that this particular wrench had been used a few days previous by a worker engaged in tightening crane rails on the track structure.

improper wheel, not suitable for the speed at which the grinder runs. All this is in addition to the hazard inherent within the tool itself, such as overspeeding as a result of a failure of the governing mechanism. In such a tool a developing defect is easily overlooked. While a conscientious workman may report that he accidentally dropped the tool, resulting in doubt as to the soundness of the wheel, the average worker is more likely to pull the trigger to see what will happen.

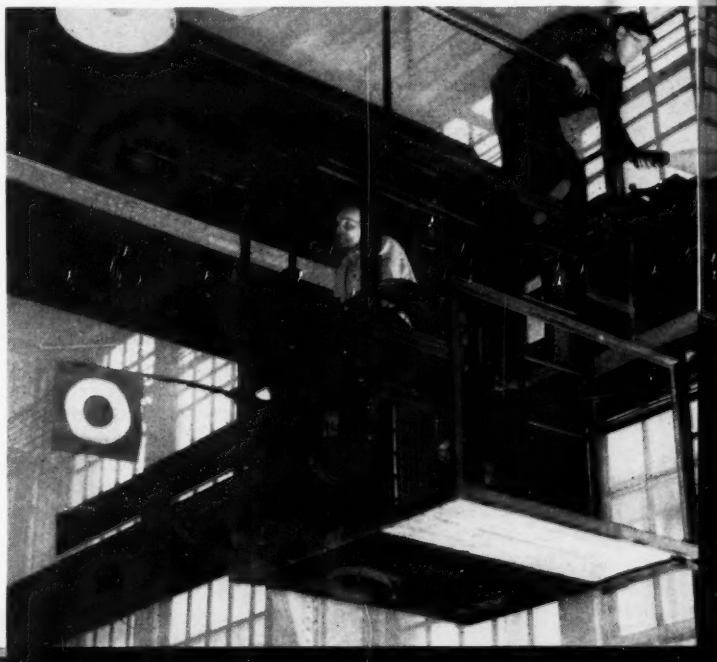
A considerable amount of thought has been given to this problem, and Allis-Chalmers is now establishing improved controls. At present we practice the following precautions.

1. A tool which is issued to a workman through a tool crib is visually examined at the time it is handed out, to make sure the guard is in place, that the wheel appears sound, and that the tool is the proper one for the job to be done. Wheels are mounted only by tool crib attendants who are trained in the proper procedure, and on the alert for improper wheels.

2. Tools are identified by serial numbers, and a roving inspector is in a continuous process of locating such tools on the floor and inspecting them.

3. Tools which find their way into the repair department are disassembled, cleaned, restored to their original condition, and their operating speed is accurately determined and adjusted before the tool is re-issued.

In spite of all precautions operators sometimes change wheels themselves, without following the proper wheel mounting procedure. In addition, our roving inspector occasionally finds a tool running considerably in excess of its rated speed. Since the tool may not return to the repair department for some time, but does return to a tool crib for re-issuing fairly frequently, we are now investigating a plan for putting an actual speed testing device directly in the tool crib. Such a device would take the form of a small table with a hole in its center, into which the air tool could be lowered, business end first. While thus lowered into the well, which is built of boiler plates strong enough to prevent damage in case of a bursting wheel, the crib attendant would run the tool up to speed. The actual speed developed would be electrically indicated and be checked against the stamped rating on the tool

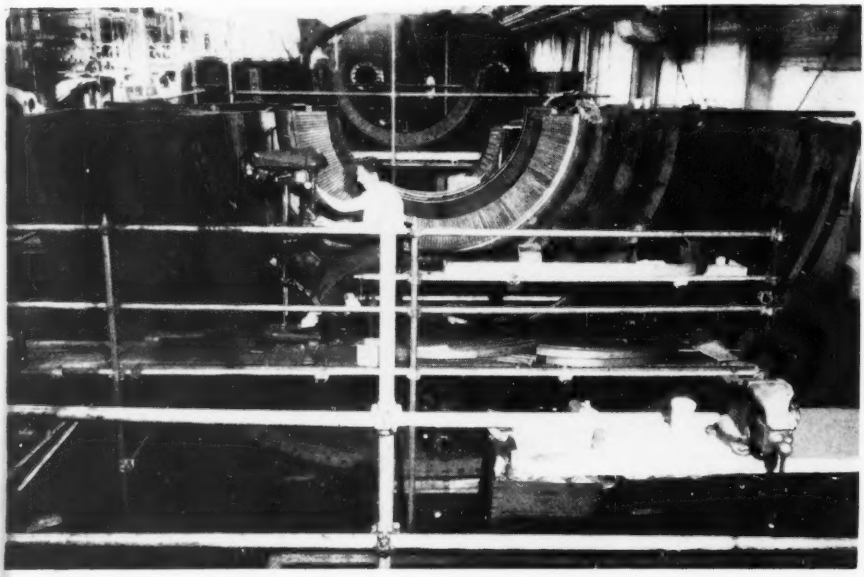


To prevent recurrence of incident pictured on opposite page, the following procedure had been worked out: After repairs are made a man is stationed on each end truck of the crane, while a third man operates the crane across the entire area involved in the repair.

itself. We thus serve two purposes: We provide a mandatory method for running the tool up to full speed, which would show up a defective wheel in most cases, and we get a check on the governor action of the tool. A final advantage would be that if a man should accidentally drop a tool, it is only a short distance to a tool crib for a recheck, making it more likely that the workman would return the tool for checking.

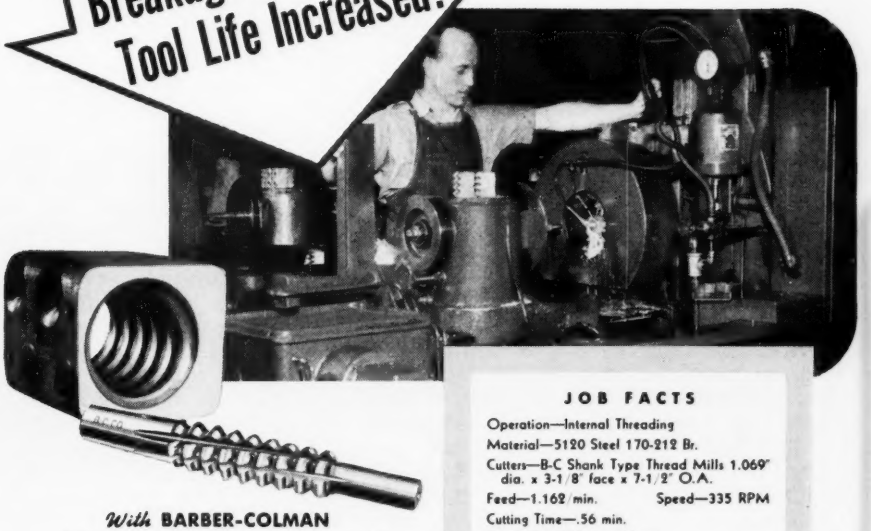
One type of defect is that which is made known to us through the issuing of routine maintenance orders. In this category are slowly developing defects. An operator who finds that the jaws of the chuck of his lathe are beginning to wear, and will need reconditioning soon, can request his foreman to issue a maintenance order, which will in due time bring about the required repair. It is not particularly hazardous to operate the machine in the meantime, so this method of notification is entirely satisfactory.

Another type is encountered where there is no operator. Here it is often necessary to resort to periodic inspection. It has been our experience in inspecting such items as building appurtenances, overhead monorails and bridge crane systems, crane rails and like items, that such inspections are not likely to be very effective unless they are made on the basis of a written record of the inspection, bearing an inspector's signature. In a small plant, with a trusted employee, it may be entirely satisfactory to rely on verbal information. In a large plant, where all operations take on a less personal aspect, it is of little benefit to select, let us say, a millwright and ask him to spend the day inspecting



Guard rails around a working platform as shown here are designed to absorb the full impact of a worker's body with a substantial margin of safety.

Breakage Eliminated! Tool Life Increased!



With **BARBER-COLMAN**
JOB-ENGINEERED FORM CUTTERS

JOB FACTS

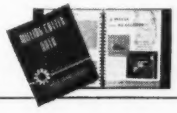
Operation—Internal Threading
Material—5120 Steel 170-212 Br.
Cutters—B-C Shank Type Thread Mills 1.069" dia. x 3-1/8" face x 7-1/2" O.A.
Feed—1.162/min. Speed—335 RPM
Cutting Time—.56 min.
Tool Life—350 pces./sharp. 10,500 pces./cutter

More production with less tool cost is the record on this job. Small diameter internal threads with special form require a tool with a long cutting face, capable of removing a large amount of metal at high speed. The heavy chip load causes vibration which, on conventional type unsupported thread cutters, results in frequent breakage and poor tool life.

Barber-Colman cutter engineers designed a special tool with extra clearances and an outboard pilot support to steady the cutting action. Now cutting time has been reduced to .56 minutes per piece and tool life has reached the remarkable level of 10,500 pieces per cutter.

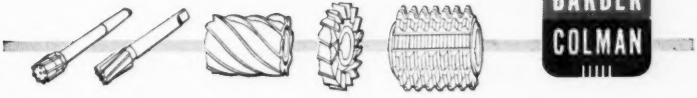
Cutting tools built to fit the specifications of the job always pay off in lower tool costs and lower production costs. That's why we'd like to show you what Barber-Colman Job-Engineered Cutters will do on your next job.

METHODS ENGINEERS!
GET THIS FREE DATA —
SEND FOR FILE No. 8510



Barber-Colman Company

GENERAL OFFICE AND PLANT
8510 Loomis Street, Rockford, Ill., U. S. A.



crane rails. He will undoubtedly do some good, but the work may not be done systematically or completely. When a periodic inspection is made at regular intervals, established and called to our attention through a positive tickler system, and when a check sheet is given to an employee telling him specifically what conditions to look for, and space is provided where he can certify with his signature that he has made certain checks, we have gone a long way to assure a good job.

Where a piece of equipment does not automatically tell us its troubles, where a routine maintenance order does not cover the situation, and where a routine inspection does not apply, we have a requirement for men whose sole business it is to assure safe practices. In the organization with which I am associated, we have groups of men known as safety foremen and safety committeemen. The safety foremen are fully trained in accident prevention work and are bonafide members of management. They are foremen not necessarily by virtue of the fact that they supervise someone but to give them the degree of authority required to do their work. It is these people who are used as inspectors for the purpose of approving guards and operation sequences. They have a substantial amount of time which is not covered by specific assignments, but which is spent patroling an area of the plant to locate hazards. As an example of their work, they caution employees to wear safety glasses when they inadvertently omit them, they report on poor hand rails, slippery stairways, unsanitary conditions which may arise, and observe people at work to make sure that they are following the safest possible job practices. Obviously these people are in a good position to call to the attention of the maintenance depart-

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ADJUSTABLE
MULTIPLE DRILL HEADS
Fit any machine, 2 to 10 Spindles.
Save 2 to 10 Operations.
PRICES: 6" DRILLING AREA
¼ capacity
21/32 center
U-1 3 Spindle Head $165.00
4 " " 171.00
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PRICES: 10" DRILLING AREA
½ capacity in cast iron standard
¾ special adaption in cast iron
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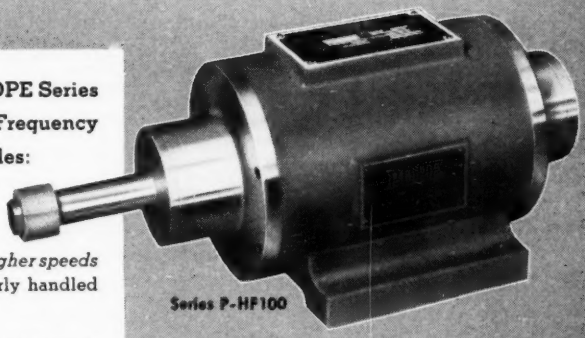
Specify **POPE Series P-HF100 High Frequency Motorized Spindles:**

—when you need *higher speeds* than can be properly handled by belt drive.

—when *more efficient* internal grinder spindles are wanted.

—when a *more compact* spindle package is desired.



Series P-HF100

POPE High Frequency, Series P-HF100 Internal Grinder Spindles are regularly furnished in speeds from 5400 to 54,000 R.P.M.

POPE designs and builds *special* High Frequency Spindles for a wide range of applications, a few of which are described below.

P-5681

POPE High Frequency Direct Motorized Cartridge Type Spindle, with 1 HP motor at 7200, 10,800, 14,400 and 21,600 RPM, using 240 and 360 cycle current in combination with a two-pole, four-pole motor.

P-693

High Frequency 16,600 RPM totally enclosed fan cooled 1 HP motorized Spindle, over-all length 18 3/16", barrel dia. 3", barrel length 9"

P-1932

High Frequency 18,000 RPM totally enclosed, fan cooled 1/2 HP motor Spindle arranged for vertical operation with the grinding wheel or tool at the upper end. Length 15 1/16", barrel dia. 2 1/2", barrel length 7 13/16". Pope sealed-in lubrication.

P-5552

POPE Heavy Duty, High Frequency, Direct Motorized, Cartridge Type Milling Spindle. 14,400 RPM, 15 HP totally enclosed, water cooled motor, 240 cycles, 3 phase. Oil mist lubrication.

When You Want A High Frequency Spindle, Let Us Have Your Specifications And We'll Provide Recommendations And Quotations.

No. 67

POPE

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POPE MACHINERY CORPORATION

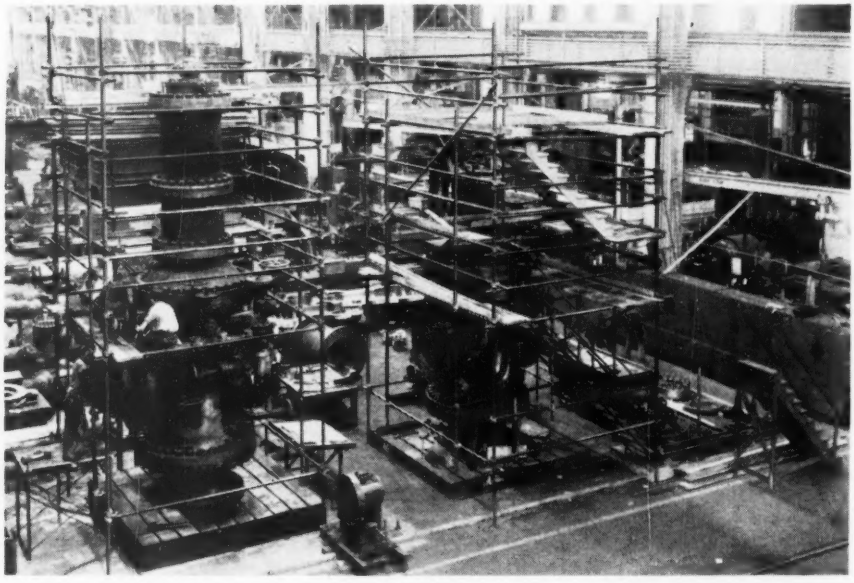
ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

ment slowly developing defects which would not otherwise be known to us.

The safety committeemen are employees who have exhibited natural tendencies toward leadership. They are used in non-supervisory capacities but are given safety training through a series of classes and meet regularly with the superintendents of their



Portable steel scaffolding used extensively throughout the plant is safe and less expensive than individually tailored wood scaffolds.

divisions to discuss safety problems and to bring to management's attention suggestions to make the plant a safer place to work in. These employees are selected by the superintendents and serve for a period of four months. By using a little psychology and selecting the right people, we have found that they have done us substantial good.

When is a safety device not a safety device?

No matter how wonderful it is, no matter what its potentialities are, a safety device is of no earthly value when it isn't being used. For that reason we must strive to design safety devices which will be used even when the foreman and the safety inspector have their backs turned. In other words, it must not unduly interfere with the operation; it must not maneuver a man into the tempting position where the elimination of the safety device will increase his earnings due to his ability to make more pieces per hour, and above all, the safety device must not in itself be a hazard.

If the safety device does not do a 100 per cent job of guarding the particular operation being performed, it is merely going to be just good enough to lull the operator into a sense of security and doublecross him when he has learned to depend on it.

Suppose you have an operation

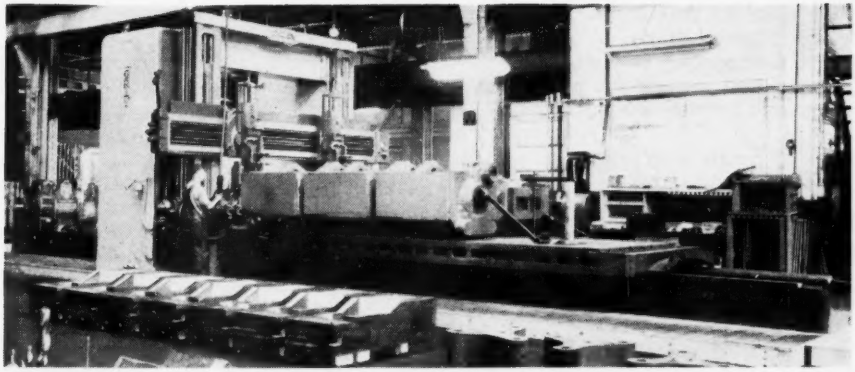


Photo courtesy Waterbury-Farrel Foundry & Machine Co.

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that requires that a man stand on a small, high platform to perform his work. Obviously it is desirable to have a guard rail around the platform. By all means furnish one, but make it so that it will absorb the full impact of a heavy man's body with a substantial margin of safety. If the guard were made of flimsy construction, such as a chain perhaps suspended from pipe posts, I would personally rather not have any guard at all than to rely on such a questionable setup. The psychology involved is simple. If you are in a hazardous position, and you are aware of it, you will be careful. If you think you have a guard rail, you will move about more freely and learn to rely on it. Perhaps your confidence will be misplaced, and an injury will result.

There are unsolved guarding problems in every field, and as far as I am concerned, circular saw guarding is one of ours. Perhaps the ultimate answer will be, in large organizations at least, to guard these machnes for specific operations only. In this way a number of machines might be required purely for safety reasons, where ordinarily all work could be performed on one.

A second category of safety devices which are not safety devices is a little less obvious. What I am referring to is the safety device which has by intent or custom become an operational device. Let us take the case of an overhead crane. This crane is provided with a limit switch which will shut off the hoisting motor when the hook has reached the upper limit of its travel. Such an upper limit switch is normally considered a safety device. But is it? If the established practice, through instruction and training of the crane operator, is to stop the hook by using the manual controller a specified distance before the limit switch is called upon to operate, it might well

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Increases Capacity Up to 800%
ADJUSTABLE TO ANY HOLE PATTERN
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If your production requires drilling from 2 to 8 holes in a work piece, a MULTI-DRILL will cut costs and speed output up to 800%. The MULTI-DRILL is universally adjustable to any hole pattern—is compactly built to permit easy, unhampered operation with drill jigs or other special fixtures. Ruggedly built to take the wear and tear of high production work, the MULTI-DRILL will handle your long and short run multiple drilling jobs with ease and economy. The MULTI-DRILL will drill on hole centers as close as ½"—handle drill sizes up to ⅜" in steel. Special adaptations available.

There is a Commander MULTI-DRILL Distributor in your area. Write for his name, literature and complete details.

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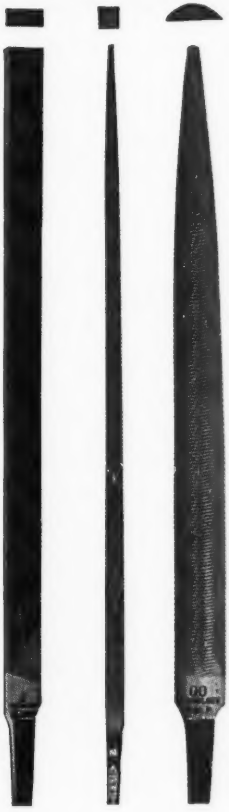
4224 WEST KINZIE ST. CHICAGO 24, ILL.

Product of *Commander* — Builder of the *Commander Tapper*

POP'S school of Filing

AIN'T THAT JUST LIKE STOOP? HE SAYS THE FINS ON THAT DIE CASTING REMIND HIM OF THE ALPS! SO HE'S KNOCKIN' 'EM OFF WITH A SWISS PATTERN FILE!
SWISS PATTERNS ARE FINISHING-FILES--WHICH IS WHAT STOOP WILL BE WHEN POP CATCHES HIM.
HE'LL GET THE POINT--RIGHT WHERE HE DON'T WANT IT!



LIKE most production-wise foremen, Pop is a bug on the use of tools. He knows that Nicholson X.F. (Extra Fine) Swiss Pattern Files, for example, are the finest finishing files you can buy. And heaven help the man who uses 'em on the wrong jobs!

Nicholson Swiss Pattern Files are widely used for removing burs left from previous machining operations, rounding out slots, smoothing small parts, and final finishing on all sorts of delicate and intricate pieces. They come in seven degrees of coarseness and scores of shapes and sizes. Available through your industrial distributor.

Send for the Nicholson booklets, ***"Ten Special File Types"*** and ***"File Filosophy."*** They're FREE.

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NICHOLSON ... *a file for every purpose*

The safety publications shown here are distributed throughout the plant as part of the continuous endeavor to make Allis-Chalmers a safer and better place in which to work.

be considered a safety device. In such a case it would be the normal operating procedure **not** to use the upper limit switch for any purpose whatever. In this case it can be considered a safety device, because if the operator should inadvertently fail to shut off the controller at the painted line or established cut off point, the limit switch would be his little guardian angel, and would take care of the situation.

On the other hand, the switch is not a safety device if it is the normal practice of the operator, by virtue of his inclination or training, to hold the controller in the "hoist" position until the upper limit switch shuts off the power for him. Should the switch fail in this case, there is nothing standing

AUTOMATIC STAKING MACHINES and COLD RIVETERS

The high speed staking machine (right) will produce over 1000 pieces per hour. For staking, riveting, eyeletting, burring, etc. Adjustable hammer blow assures easy, safe operation.

The cold riveter (left) is made in 10 sizes to handle work from 1/64" to 2" diameter.

Send us samples for demonstration.

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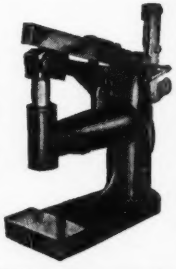

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★ **May be worked-at from all sides**

★ **Self locking at any height**

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Table locks securely wherever stopped.

WILL NOT TIP OR SLIP

A work bench when and where you need it.

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giving detailed data

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A combination you'll find it hard to beat for good service and lasting quality. Your Victor distributor knows that in a recent test "Molyflex" *averaged 23.8% more metal cut than all the leading brands tested.* He'll tell you that "Molyflex" is unbreakable in a frame . . . and more uniform. He's an expert in solving metal cutting problems.

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Ask him about our new genuine soapstone metal marking crayons. O.K. on hot, cold, damp or grimy metal. Markings withstand pickling, yet do not affect enamel application.

Be sure to ask for your free copy of the Victor Metal Cutting Booklet and the Victor Wall Chart to get maximum efficiency from metal cutting saw blades.

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Makers of Hand and Power Hack Saw Blades, Frames and Band Saw Blades

in the way of a crane or cable failure with possible serious results.

Although not an industrial analogy, a similar case of a safety device which can easily become an operational device is the wing de-icing system used on commercial airplanes. During the icing season all commercial aircraft are equipped with a system of removing the ice from the leading edge of the wings and control surfaces of the airplane. Although the planes are so equipped, the airlines do **not** willingly schedule flights through areas known to contain icing conditions. In other words, they consider their guardian angel to be the de-icing equipment with which the ship is equipped, should it inadvertently, and contrary to plan, get into an icing zone.

In this case we have a valuable safety device, contributing greatly to passenger safety.

On the other hand, if airlines would knowingly schedule planes to fly through icing areas, the de-icers would become part of the **operational** equipment of the aircraft, and in the event of a failure or malfunctioning, there would be no safety device, and possibly disastrous results.

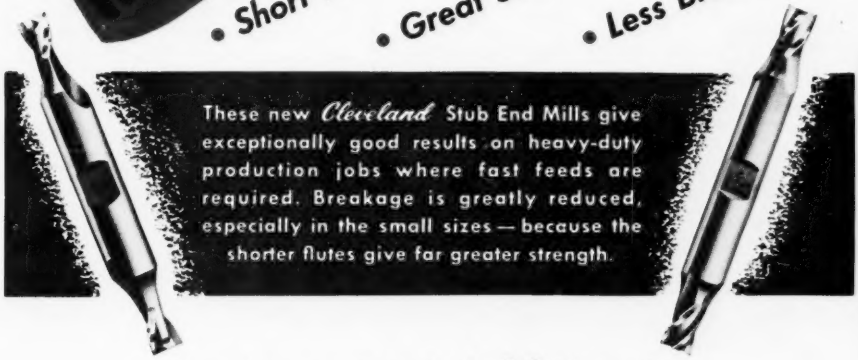
In conclusion, it is hoped that the foregoing remarks have stimulated the readers' thinking in terms of measures which he might take in his own shop to bring about safer working conditions.

For further information on any product mentioned in this issue—use the READER SERVICE CARD between the covers.

Cleveland STUB END MILLS

NEW!

• Short Flutes! • Great Strength! • Less Breakage!



These new *Cleveland* Stub End Mills give exceptionally good results on heavy-duty production jobs where fast feeds are required. Breakage is greatly reduced, especially in the small sizes—because the shorter flutes give far greater strength.

An Important Addition to the Redesigned *Cleveland* Line

STRONGER No sharp corners or points where localization of stresses might occur. Minimum amount of metal has been cut away. (Stub End Mills have an *extra* factor of strength due to their shorter flutes).

CLEAR CHIPS BETTER Redesigned flutes are machine polished. There are no pockets. Chips are free to move.

GREATER ACCURACY New clearance and accurate machine polish of flutes result in closer control of size.

MORE DURABLE New-style clearance supports the cutting edge; assures against "flaking" or "chipping out".

LONGER LIFE Radically new flute shape and chip clearing ability reduce wear on the cutting edge, thus maintaining consistent accuracy.

CUT FASTER New flute shape gives maximum cutting qualities at increased rates of feed.

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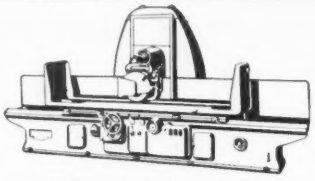
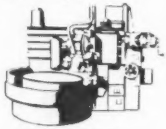


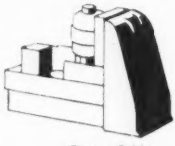
Precision Surface Grinders
Horizontal Spindle

Disc Grinders,
Double Spindle Type

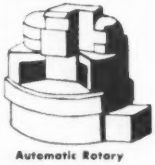
Vertical Spindle
Disc Grinders



Plano Grinders,
Rotary Table Type



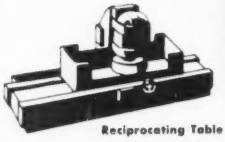
Rotary Table
Surface Grinders



Automatic Rotary
Surface Grinders

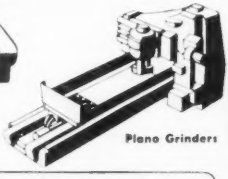
Reciprocating Table
Face Grinders

Disc Grinders,
Single Spindle Type



Reciprocating Table
Surface Grinders
Vertical Spindle

Face Grinders,
Traveling Wheel



Plano Grinders

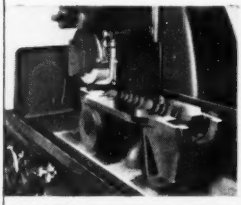
MATTISON GRINDERS

If its a Flat Surface to Grind
There's a Mattison to Grind it.

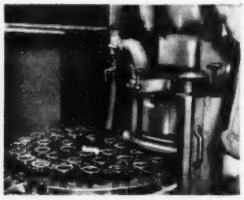
● With the addition of the production grinding machinery formerly made by the Hanchett Manufacturing Company, Mattison now is in a position to work with you on all your surface, face and disc grinding problems. These machines are made in various types to handle a wide range of work. Experienced fixture engineers are available to give you best production efficiency with Mattison Machines.

For any flat grinding, ask for our recommendations on the proper method and machine for your job. No obligation, of course.

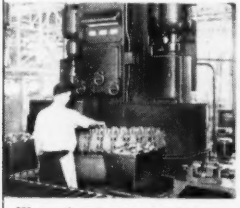
For catalog on all machines, ask for free copy of general bulletin.



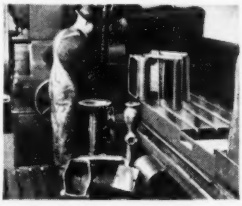
40 hours before — now 4 hours. Pump case ground on Mattison Horizontal Spindle Precision Surface Grinder



320 surfaces of cast iron compression heads per hour, removing 1 32" stock with Mattison No. 24 Rotary Surface Grinder



900 connecting rods per hour, using 40 station fixture to finish grind crank and wrist pin end of assembled rod with Mattison No. 72 Grinder



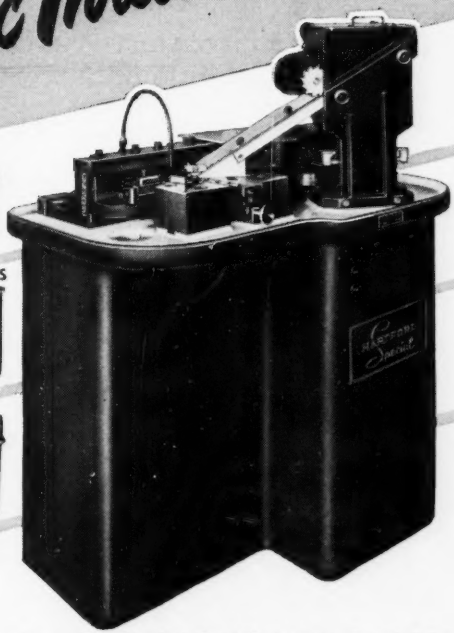
Shows variety of work run on Mattison Face Grinders

MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS

LOW COST — HIGH PRODUCTION

HARTFORD *Special*

Automatic Thread Roller



This Automatic Thread Roller is designed to solve standard and special thread rolling problems on small size screws from .086" to .190" in diameter with thread length capacity from ⅛" to 1½", rolling consistently to Class 3 Thread Fit. Careful engineering and rugged construction make it capable of continued high production runs with startling economy.

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Machining Parts For Fireball Engines

Special tooling meets increased production requirements of automobile engine parts

By Herbert Chase

THE powerful Fireball Dynaflash engines, built in the Flint, Michigan plant of the Buick Motor Division, are an outstanding engineering achievement made possible largely through the application of high production machine tools. Several of the more interesting and unusual machining operations involved in the production of these motors are presented herewith.

Guides for valve stems are among the many parts which are produced in large quantities. These guides are cast in the Buick foundry and in the initial machining operation the o.d. is ground on a centerless grinding machine. Castings are then fed into a machine which automatically faces one end, chamfers it, drills a central hole, reams it and ejects the piece.

Pieces are then transferred to a battery of automatic lathes and are placed by hand in magazines with the proper end out. Setups such as that shown, with cover removed, in Fig. 1 are used. Each machine is equipped with an automatic loading and pickoff device which, in combination with the usual cams for operating front and rear tools, makes the machine completely automatic except for keeping the magazine filled.

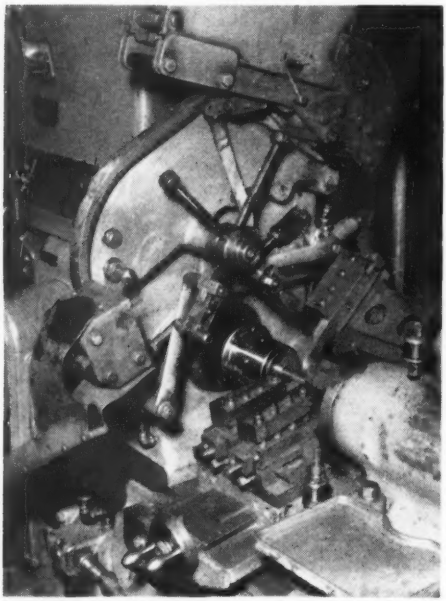

Fig. 1—Setup in an automatic lathe for final machining of Buick valve stem guides. A cover is removed to show the arms that pick pieces from the magazine (Top) load them in the chuck and, after machining, transfer them into the chute, (Lower Left).

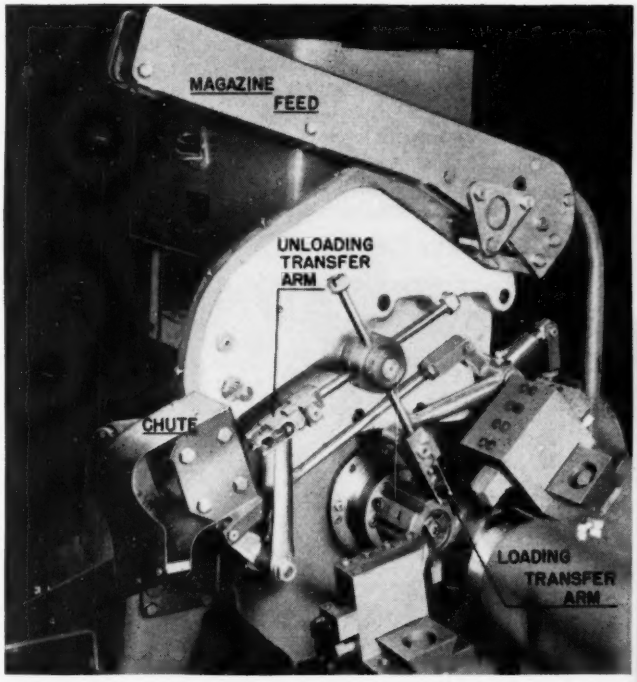

Fig. 2 — Closeup of the automatic loading and unloading device but with tooling slightly different from that used by Buick. Also lacking is the gate operating arm not needed in all applications.

Loading and pickoff are done by a pair of transfer arms equipped with spring clips at one end, as shown in Fig. 2. These arms are given both a radial and rocking motion with respect to their supporting hub which is indexed automatically in synchronism with events of the machining cycle. This motion is such that the fingers on the loading arm pick a piece from the lower rear end of the magazine, load it into the chuck and retract while machining is done. Then the unloading arm picks the machined piece from the chuck, transfers it to an unloading point and drops the piece into a discharge chute down which the piece slides into a tote pan.

When the chuck, which turns at 2500 rpm., grips the piece and the loading fingers are retracted, the left tool in the front holder finish turns a step diameter, removing 0.040 in. of metal and, as this tool nears the end of its traverse, the right tool in the same holder finish faces the end. Then the rear tool is rocked in to chamfer the end of the piece. When this tool retracts, the unloader fingers pick off the machined piece, the next one is loaded automatically and the cycle is repeated. With this setup, nine pieces a minute are machined or a total of 540 an hour.

Both arms of the automatic loading and pickoff device move radially independently and each performs its own functions. They follow each other around, remaining 90 deg. apart and operate in succession, the loader always being one station ahead of the unloader. Radial motions of the arms are effected by rocking levers whose motion in cam controlled. Also cam operated are a gate at the magazine and the pushout that unloads the fingers at the discharge chute.

There are numerous items that go into the Buick engine which require minor secondary operations. As these operations would be slow if performed by ordinary hand methods, many spec-

ial fixtures or feeding devices are employed to expedite such work. One of these, made especially for hole chamfering, is shown in Figs. 3 and 4. This fixture is designed to handle several sizes of short cylindrical parts, being employed, for example, on blanks for speedometer drive gears, as here shown installed on the table of a drillpress.

positions the blanks loosely between the guide ring and the side walls of the Vee-shaped dial notches. When each blank reaches the chamfering position, it is gripped momentarily in the Vee of an air operated clamp that presses the blank against the walls of the dial notch. Pressure applied by means of the air clamp keeps the blank from rotating while the chamfering drill is

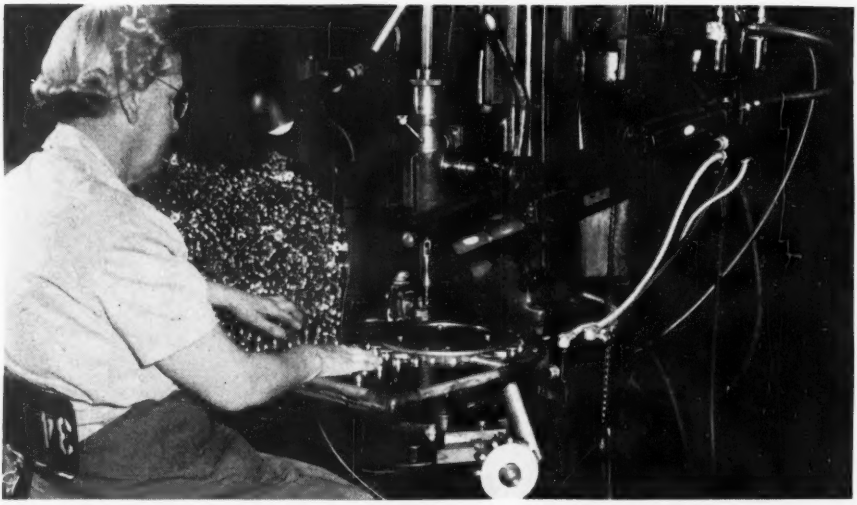

Fig. 3—Drillpress equipped with a special semiautomatic dial to advance parts fed by hand into its notches through a position there hole chamfering is done at the rate of 40 to 50 pieces a minute. Actuation is by air plungers.

This drillpress is equipped with an air cylinder whose plunger is arranged to feed the drill down a fixed distance and withdraw it every time a blank is indexed into chamfering position. The fixture, mounted on the table of the drillpress, includes a horizontal dial arranged to index on a flat plate onto which the parts feed down a chute, as shown. All the operator need do is to slide the parts with the proper side up along the plate and into notches around the periphery of the dial.

As the dial indexes, the parts are advanced around a guide ring which

advanced and the is retracted.

Immediately thereafter, the clamping ram is drawn back far enough to clear the piece. Further motion of the clamp indexes the dial one notch to bring the next blank into chamfering position and the cycle repeats. After chamfering, blanks continue to advance until they reach a hole above a chute through which they fall into a tote box.

It is necessary, of course, to synchronize the motions of the plunger that feeds and retracts the drill and that which clamps the work and in-

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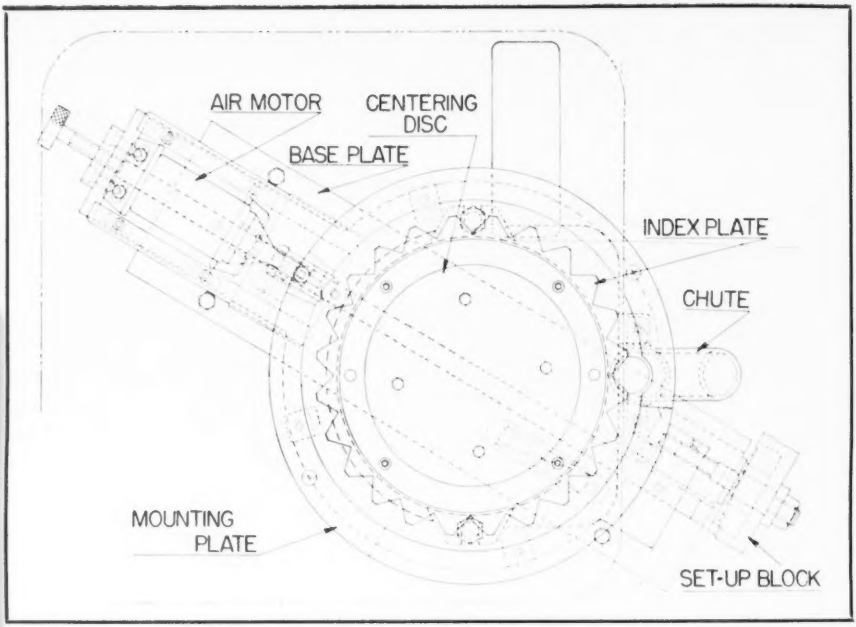

Fig. 4—Drawing of the dial feeding assembly which includes an air cylinder and plunger that clamp the work and, when the clamp retracts, indexes the dial so that the cycle is repeated continuously.

dexes the dial. This is accomplished through electrical contacts actuated by the air plungers. These contacts control, in turn, solenoids which open and close the air valves for the air cylinders. Once the drillpress motor is started and the air supply is turned on, the fixture begins to function and repeats its cycle indefinitely. Although the operator generally keeps dial notches filled as they pass the loading poistion, no harm results if they are not filled. The dial speed is commonly so set that an average of 40 to 50 pieces a minute are chamfered.

Parts that differ only slightly in diameter can be handled without changing the dial. For greater variations in

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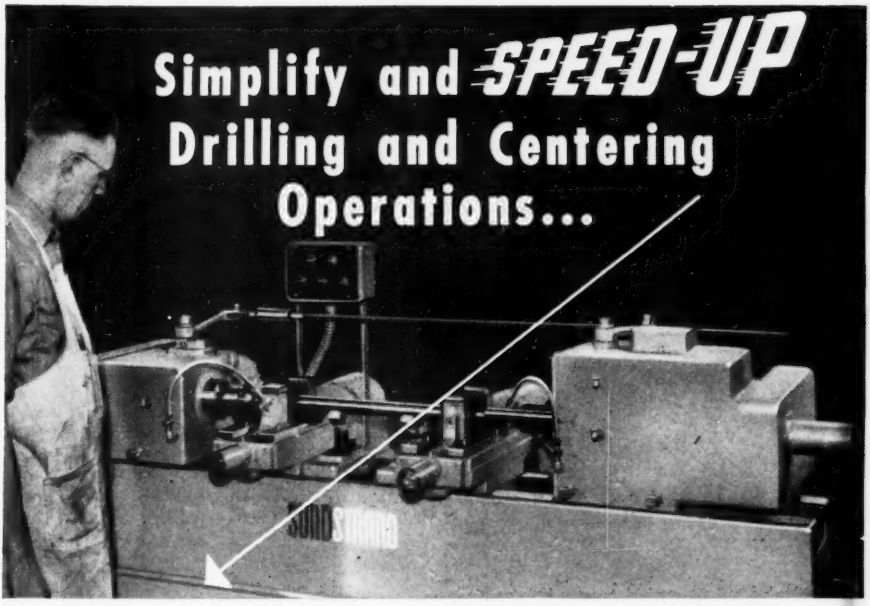

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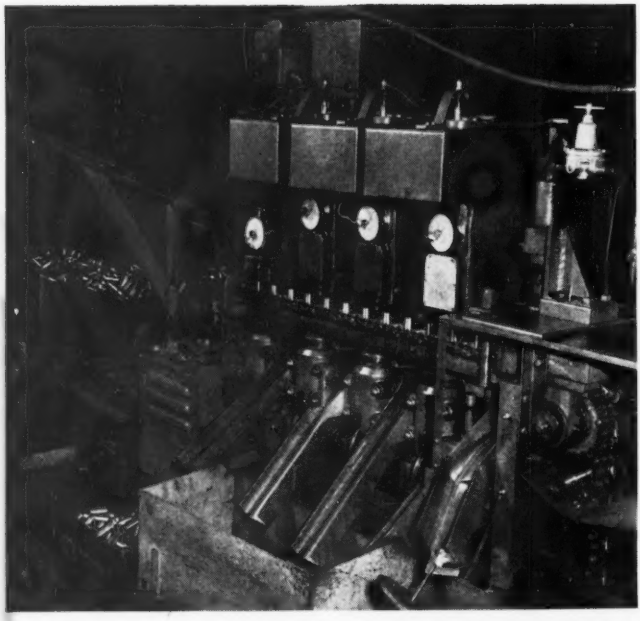

Fig. 5—General view of the automatic hardness tester for tappets in use in the Buick plant. Tappets fed by hand into the chute, top left, and out onto the conveyor that indexes them through five stations, are automatically rejected if not up to specifications.

size, it is necessary to change the guide ring to one of larger or smaller diameter. Air plunger strokes can be varied if necessary by changing electrical contact positions. The fixture could be used not only for chamfering but to spot or drill holes or do other operations for which a drillpress is suited.

Sixteen hydraulic valve lifters are required in each Buick engine equipped with this type of lifter. As specifications require that each lifter must be checked for hardness at three three points and rejected if below 50 Rockwell "C",. It is essential to employ an automatic machine if the labor of hand checking is to be avoided. For this reason, the machine illustrated in Fig. 5 was developed to meet Buick specifications and is now in use by the Buick Motor Division.

The lifters, or tappets, as they are commonly called, are of cast iron. Each has a chilled head and it is the top face of this head that must be checked at three points.

To accomplish this, the tappets are loaded by hand into an inclined tube, head up, and feed down this tube into spaced recesses between special hinged

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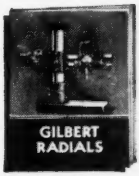

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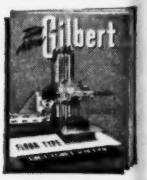

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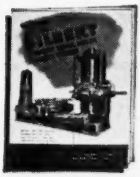

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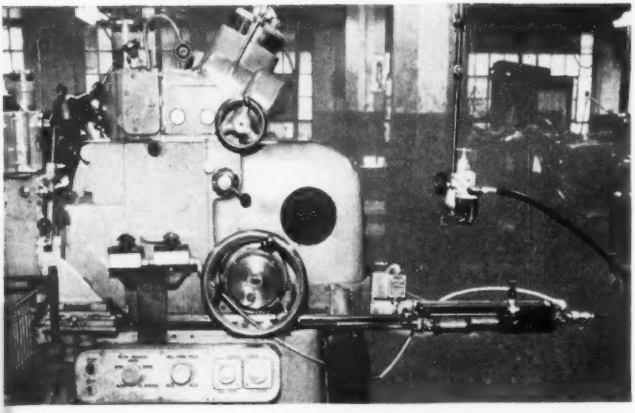

Fig. 6 — Centerless grinder as equipped with air motors, right, applied by Buick for power operation of the carriage in grinding the formed contour of shifter indicator levers. Output was upped one-third by use of this machine.

links advanced between a pair of roller chains. These chains are indexed in an intermittent motion along a track. Each tappet stops at each of five stations unless ejected before reaching the fifth station where the accepted tappets drop through a chute into a tote box.

At each of the first four stations, the tappet is lifted by a cam and contacts a plunger with an effect indicated on the dial above the respective stations. At the first station, there is a dial gage. If it does not move a set minimum distance, the tappet is too short and is rejected on this score, fall-

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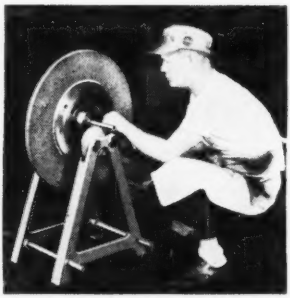

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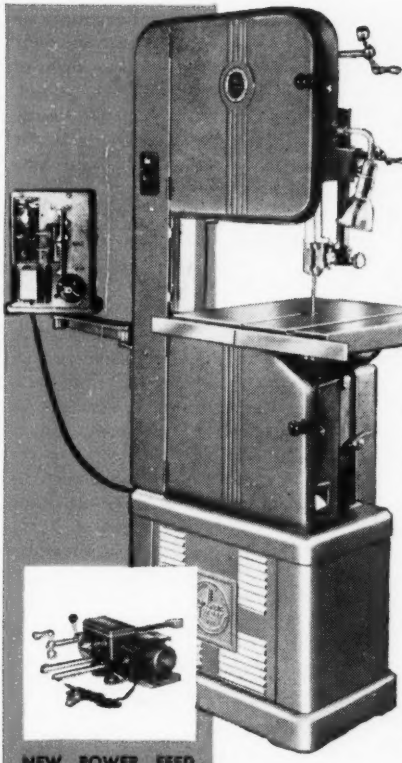

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ing through a gate that opens automatically after the tappet leaves the station if length is below that specified.

Above each of the next three stations is the dial of a hardness tester. The indenter of each is set to contact the tappet, one indentation being made at each of three different points. When the cam raises the tappet, the indenter indicates on its dial the hardness at the corresponding point. If the reading is below standard, a gate opens automatically after the tappet is next indexed and it falls into a reject tote box. Tappets of hardness above 50 Rockwell "C" continue to the fifth station and there drop into a chute and thence into a box for accepted tappets.

With this setup, only a single operator is required and the machine checks the hardness of 11,250 tappets per eight-hour shift. The operator merely feeds tappets right end up into the chute and moves tote boxes as they are filled, keeping an eye on the machine to see that it functions continuously as intended. The saving in labor over hand checking is large and the human errors of hand checking are avoided. When loading the tappets, the operator visually inspects the hard end for foundry defects. Included in the machine are counters, one of which counts the number of tappets entering it and the other counts the number accepted for use.

Shifter indicator levers, used on Buick cars equipped with Dynaflow torque converter transmissions, are formed steel levers that require centerless grinding in preparation for plating. Between grinds, the carriage on which one wheel of this machine is mounted must be withdrawn for removal of the ground lever and returned, to a fixed point, when the next piece is inserted and ground.

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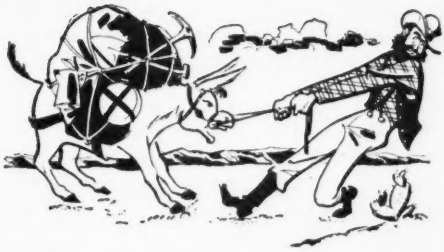

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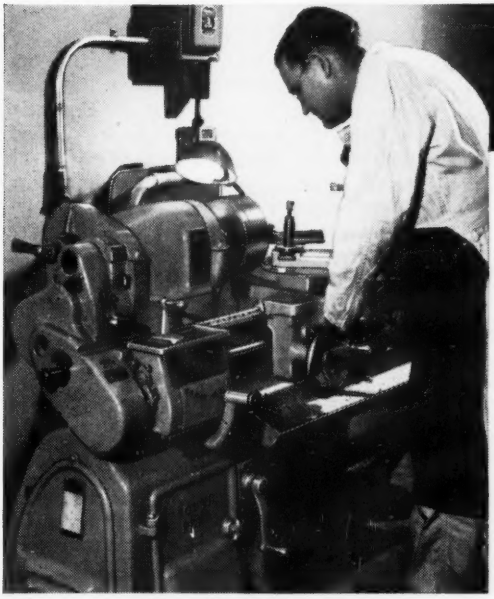

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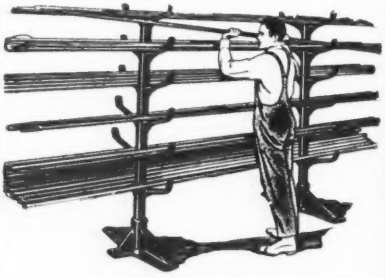

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Moreover, as the carriage is heavy, the effort applied in reversing its motion is considerable. Until recently, carriage motion on the machine used by Buick was effected by the hand wheel provided for this purpose. As this was tiring for the operator, it was decided to provide power to traverse the carriage in both directions. As a result, output was increased from 850 to 900 workpieces per eight-hour shift to 1200 workpieces in the same time.

Traversing is now accomplished through the use of a pair of air motors which have been applied to a rack engaging a gear on the hub of the hand wheel, as shown in Fig. 6. Forward motion, including the latter portion when heavy pressure is applied to the work, is done by the plunger of a 3-in. cylinder fed with air through a reducing valve that drops the line pressure to 38 psi. An adjustable limit switch connected with solenoid operated air valves stops motion when the wheel has fed in to the depth required to size the work. Air is then applied to the 1-in. plunger of a second air motor for return motion of the carriage. This motor consumes less air than if the larger air motor was used for both forward and reverse motion.

While the carriage is being withdrawn and returned, the operator has ample time to rock the work holder back, remove the ground piece, put another in its place and return the holder to working position. As this requires only slight effort and the carriage is moved automatically by the air motors, the job is converted from a tiring one to a relatively light one. Manually operated buttons conveniently placed make it easy to start and stop the machine, including carriage motion, at any time.

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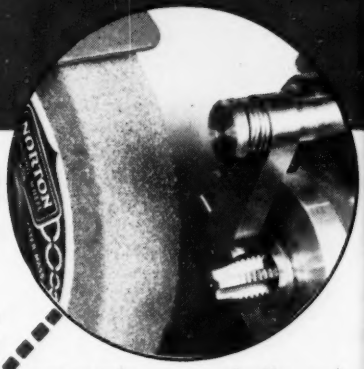

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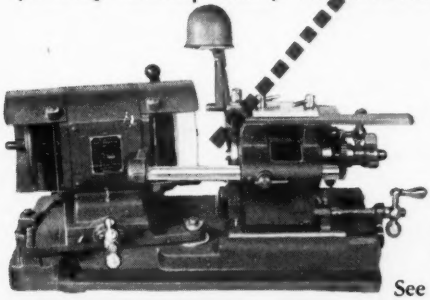

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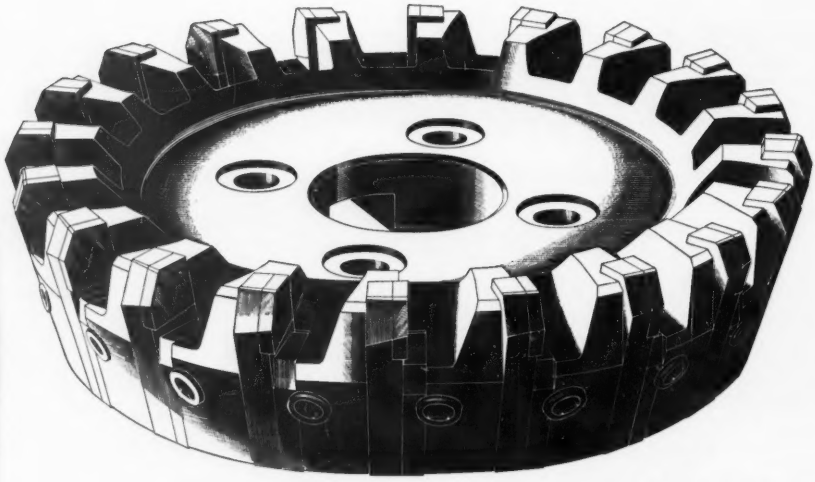

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C. W. Hinman

Analyzing Blank and Scrap Strip Developments

Instructions on computing the area of blanks, laying out scrap strips, and laying out die blocks.

By C. W. HINMAN
Designing Engineer

WHEN a blanking die must be designed for a piece of work which is shown as being either partially or completely formed on the blueprint, the size and shape of the blank must be developed even before an attempt is made to design the scrap-strip.

Developed blank widths and lengths are computed from the inside dimensions of arc-bends. These inside dimensions serve to locate the radial centers that scribe the bends. If dimensions of the formed part are given outside the bends, as shown in Fig. 1, then another sketch should be prepared as shown in Fig 2, from which the flat blank dimensions can be readily computed. The dotted lines in the sketches represent the positions of the neutral bending lines.

If we let **L** represent the developed length, or the unknown quantity to be found in Fig. 2, then $\mathbf{L} = \mathbf{H} + \mathbf{W} + \mathbf{Y}$, in which $\mathbf{Y} = (\mathbf{T}/3 + \mathbf{R}) \times 1.5708$, for a 90-deg. bend. By substituting the figures in the formula we have: $(1.5 + 0.75) + (\overline{0.054 + 0.088} \times 1.5708) =$ 2.473 in., or **L** the developed length.

For any angular bend, $\mathbf{Y} = (\mathbf{T}/3 + \mathbf{R}) \times 0.01745 \times \mathbf{N}$, in which **N** is the number of degrees in the angle. If the angle is composed of degrees, minutes, and seconds are arc, **N** must be reduced to a whole number and decimal fraction before it can be used in the formula. However, actual practice has shown that for a 90-deg. sharp-cornered bend, as shown in Fig. 3, the developed length is sufficiently accurate when calculated as follows: $\mathbf{L} = \mathbf{H} + \mathbf{W} + \mathbf{T}/3$, but this formula produces a blank slightly too long which is usually not a bad fault. It ensures that there will be plenty of metal in the blank to form the part.

In Fig. 4 the developed length is $\mathbf{L} = 1.5\ (\mathbf{T}/3 + \mathbf{R}) \times 1.5708 + \mathbf{H} + \mathbf{W} + \mathbf{X}$. In Fig. 5: $\mathbf{L} = (\mathbf{T}/3 + \mathbf{R}) + (\mathbf{T}/3 + \mathbf{r}) \times 1.5708 + \mathbf{H} + \mathbf{W} + \mathbf{X} + \mathbf{x}$.

For circular tubes, as shown in Fig. 6 when **R** is greater than **2T**, the neutral bending line is central in the circular strip. This is also the case for all bends where **R** is greater than **2T**. For the circular arc length of sector **Y** in Fig. 6: $\mathbf{L} = 0.01745 \times \mathbf{A} \times \mathbf{R}$, in which

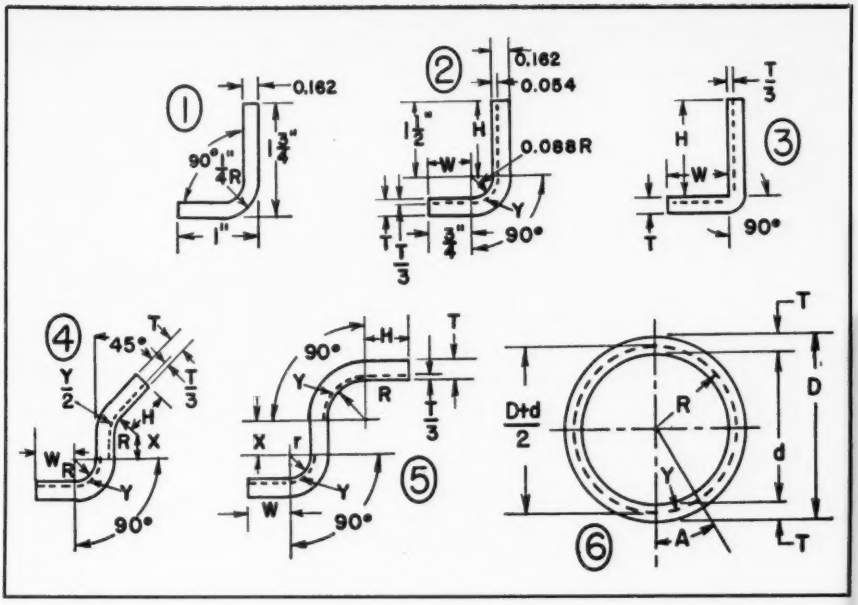

Fig. 1 to 6—Illustrations for use in calculating the flat developed lengths of formed-up blanks when Y represents the length of arc bend.

A is the number of degrees in the angle.

The following easy-to-use table is a help in determining the lengths of circular arcs scribed by any radius. It is based upon the lengths of circular arcs for the radius 1, or unity. For 1 deg., the lenth of arc is 0.0174533; for 1 min., 0.0002909; and for 1 sec., 0.00000484.

Example: What is the circular length of an arc of 3 deg., 10 min., and 12 sec., scribed by a radius of 2.5 in.?

Solution:

$$0.01745330 \times 3 = 0.0523599$$
$$0.00029090 \times 10 = 0.0029090$$
$$0.00000484 \times 12 = 0.0000581$$
$$\text{add } 0.0553270$$
$$0.055327 \times 2.5 \text{ in.} = 0.1383175 \text{ in.}$$

The three constants give correct results up to six decimal places, which is sufficient for all tool engineering purposes.

Unfolding the Blank

To illustrate the use of the foregoing formulas: Fig. 7 is an engineer's drawing of a mild steel yoke containing three holes. The thickness **T** of the work is 5/64 in., and a blank development is required preparatory to designing the scrap-strip for a tandem perforating and blanking die.

The width **W** of the blank as shown in Fig. 8 is determined by adding twice the blank lengths of projections **P** to the breadth **B** of the work. This is done by following Fig. 3 for developing the lengths of square cornered bends. The overall length **L** of the blank is determined by adding twice the lengths **Y** + **y** to the sum of the straight dimensions of the work, in Fig. 7 or 2 (**Y** + **y**) + 2 in.

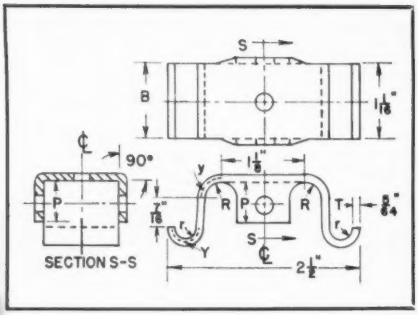

Fig. 7—Engineers' drawing of a mild steel yoke containing three holes.

Designing Scrap Strips

Necks of metal left between the cut blanks should be fully as wide as the blank thickness, and for thin blanks (under 1/32 in.) the necks should be two or more times the blank thickness. The metal necks at the outer edges of the strip should not be less than 1½ times the blank thickness. These allowances provide a strong scrap frame for pulling through the final end of the strip, and for cases where a pulling pair of feed rolls are used on the left side of the press. The designer should always ascertain in advance the method of feeding to be used for the strip.

The popular method for laying out scrap strips is to use three cardboard templates of the deveoped blank. The templates should be 1/64 in. undersize to allow for scribing pencil lines. In the course of positioning the cardboard templates in a proposed strip, the most economical layout is found by multiplying the distance between blanking centers by the proposed width of strip, and then compare the areas of two or more experimental layouts. The layout with the least amount of area will, of course require the least amount of material, but there may be several reasons why it could not be used. 1. It

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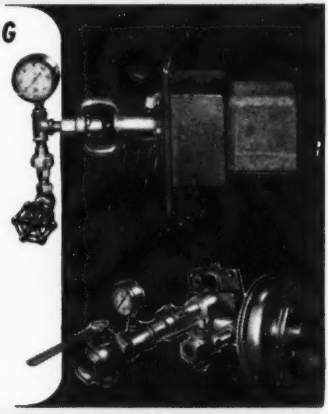

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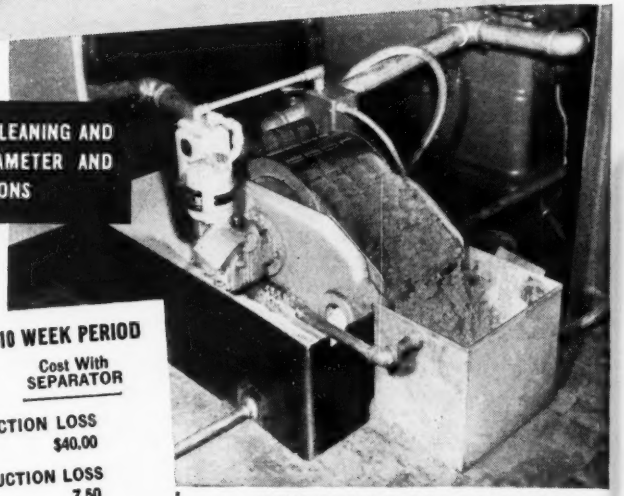

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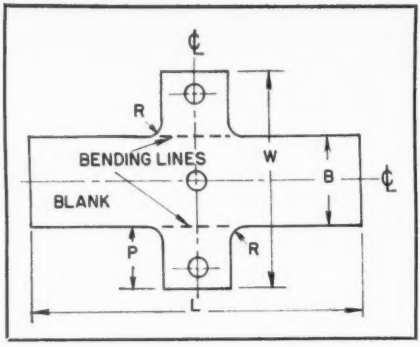

Fig. 8—Drawing showing blank development of workpiece shown in Fig. 7.

may have the wrong grain direction across the blanks for subsequent forming operations. The grain runs parallel with the strip, and sharp bends must be located at a generous angle to the grain to prevent bending fractures. 2. Shearing a multiple of strips, of the proposed width may be wasetful, or 3. The blanking centers may be too long for high-speed production in the die, and the final waste end of the strip would probably be too long for good economy.

Layouts in which the strip is passed through the die twice for a double-row should be avoided if possible, but for saving material such layouts are sometimes a "must." It is not unusual to design the die for cutting two or more blanks at each press stroke; thus, a multiple of blanks are made in one pass of the strip. Blanking dies of this type are high-speed producers, but are too expensive to build except for high quantity production.

Scrap strip layouts present as many problems as the shapes of the blanks involved. It is possible sometimes to arrange the blanks in the scrap strip in many different positions, and three positions may be similar so far as material economy is concerned, therefore,

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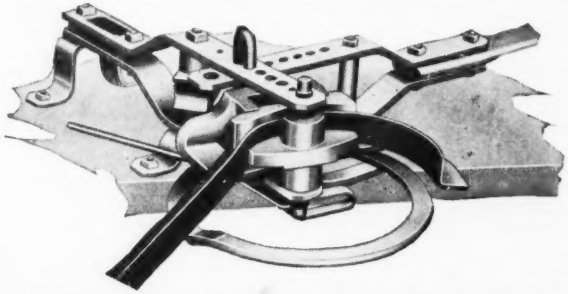

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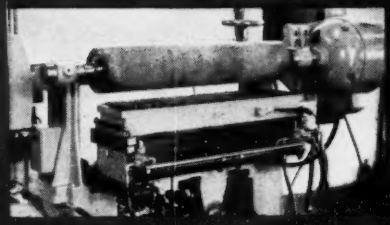
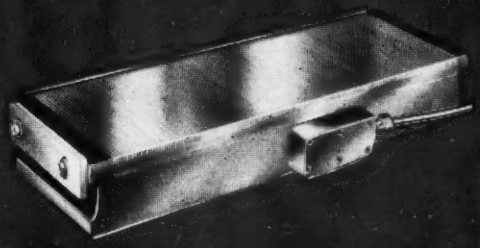


Load of six knife plier sections in place on a MAGNA-LOCK Chuck. A full load consists of 28 sections.



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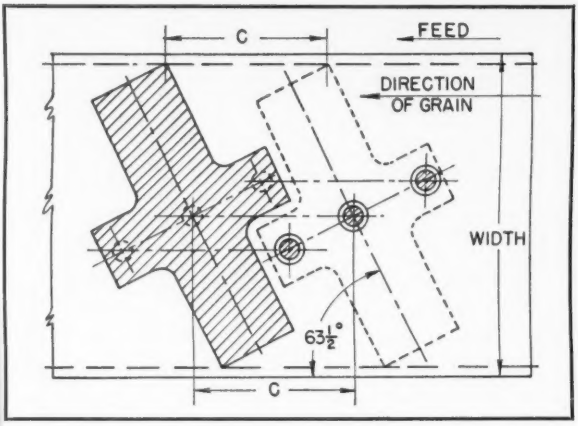

Fig. 9—Standard scrap-strip layout for the blank shown in Fig. 8.

they must all be studied carefully in order to adopt the right one. Why? Simply because in the use of expensive material, like brass, copper, or phosphor bronze, an uneconomical scrap strip may waste as much as $5,000 annually when production is high. There are not many scrap strips in use today that cannot be improved. Improvements can be made to effect economy by using shorter blanking centers and higher speed, or by the elimination or the installation of multiple rows of blanks.

Two Scrap Strips for the Yoke

A scrap-strip for the blank shown in Fig. 8 was laid out as illustrated in Fig.

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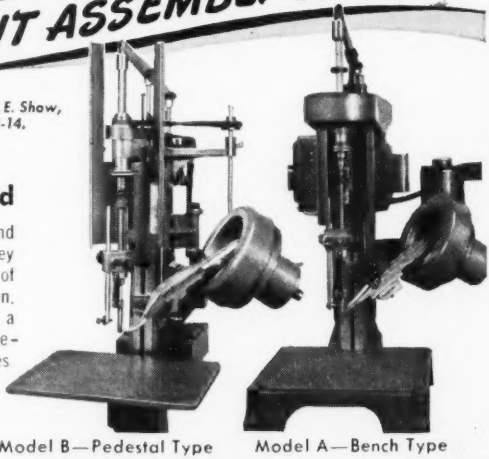

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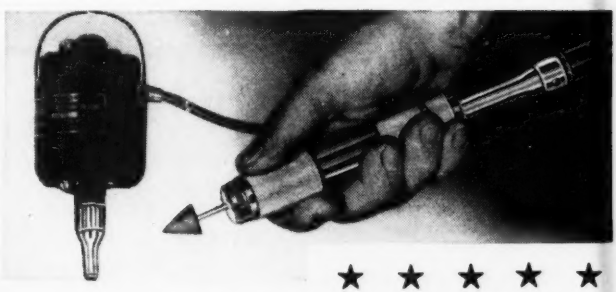

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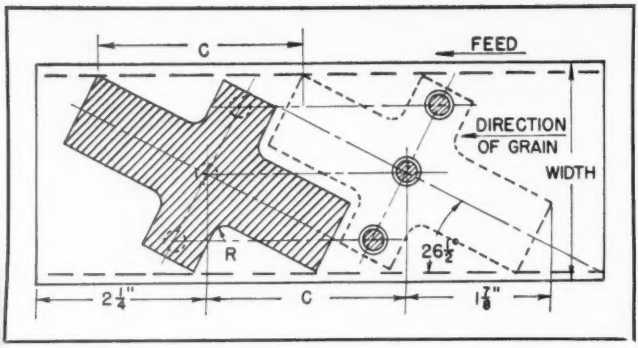

Fig. 10—Drawing showing second trial layout in which computation reveals a saving of one square inch per blank as compared to the first layout.

9. This is a standard layout for a blank of this type and is considered an economical layout. But another layout, as shown in Fig. 10, revealed that the first layout would waste one square inch of material for each blank cut. This waste amounted to 350 square feet when cutting 50,000 blanks, and the cash loss was well over one hundred dollars.

Blanking Center C in Fig 10 is not great enough to slow down the feeding of the strip, and the narrower width of the strip involved facilitates rapid handling.

It is possible to add another row of blanks to the strip shown in Fig. 10 by using a wider strip, but the gain is small, and the wider strip could not be so easily handled. It is never good practice to use multiple rows of blanks unless absolutely necessary.

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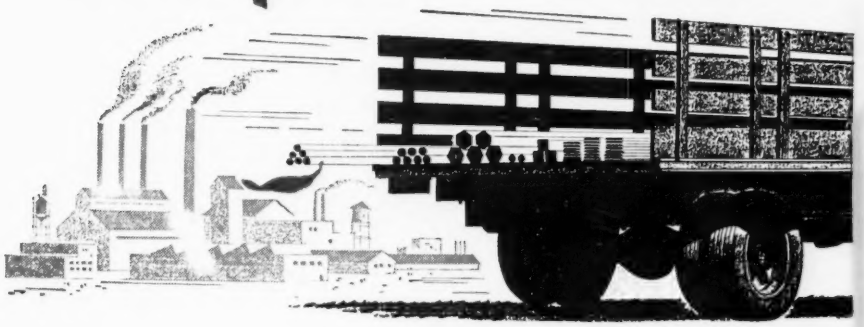

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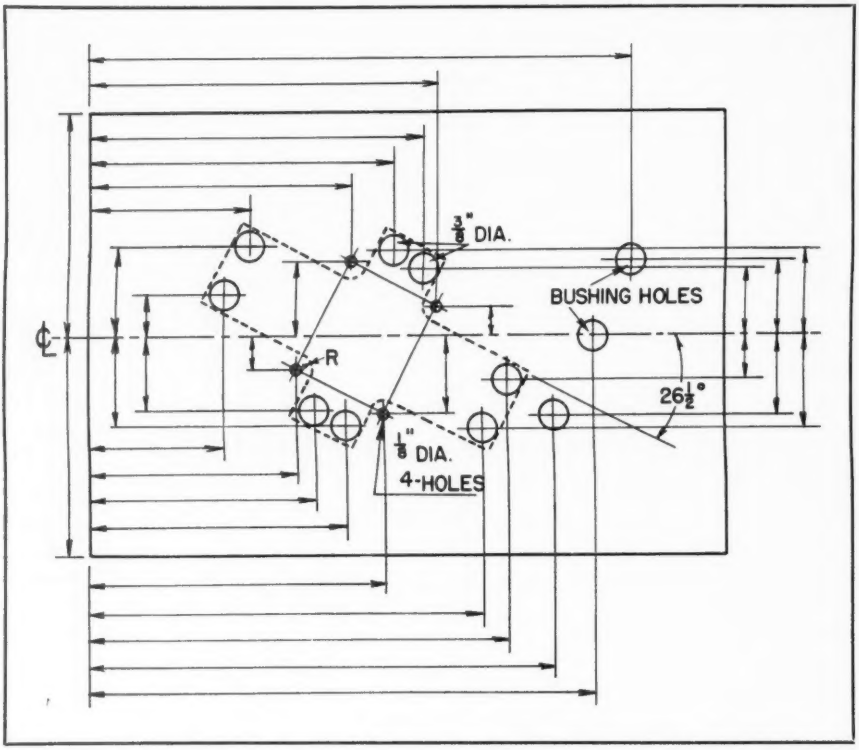

Fig. 11—Drawing which illustrates the procedure to be followed when designing the die block.

Computing the Scrap Strip

The area **A** of the strip required to cut one blank is **C** times its width. The percentage of the strip occupied by one blank is the blank area divided by **A**. This percentage should be between 60 and 75 per cent for economical production. The weight per square foot of No. 14 U. S. Gauge (0.0781 in. sheet steel) is 3⅛ pounds avoirdupois. Total pounds of strip necessary to make 1,000 blanks is 7.3 × **A** × 3.125, in which 7.3 is a constant that allows 5 per cent for waste ends and miscuts. The length of the cut edges (including the 3 round holes) is 15 inch. The blanking pressure required is 15 in. × 0.0781 in. × 25 tons, or 29¼ tons. Allowing 25 per cent for additional blanking pressure, a press of 37 tons capacity should be used. The stripping pressure is 15 in. × 0.0781 × 3,500, or

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Buckeye Quality Bronze—always available in adequate Distributor service stocks—is the consistent choice of:

PURCHASING AGENTS — because Buckeye offers 1088 Sizes of Standard Stock Phosphor Bronze Bearings; 156 Sizes in popular 13" length, Fully Machined Bars.

DESIGN ENGINEERS—Buckeye's proven experience in solving thousands of Special bearing problems provides up-to-the-minute knowledge for proper alloy and machining recommendations.

MAINTENANCE ENGINEERS — because replacement requirements are immediately met with highest quality bronze—in a wide range of sizes—to maintain trouble-free power transmission.

For Every STOCK BEARING REQUIREMENT • • • Consult the BUCKEYE Handy Pocket Size Catalog..

In the office — in the shop — Catalog No. 480, with many quick reference features, lists Buckeye's complete line of Maintenance Bars and Stock Bearings stocked by leading distributors in every important industrial area.
Write for Your Copy and name of your nearest Buckeye Distributor, Today!

Buckeye

BRASS AND MANUFACTURING COMPANY

BRONZESMITHS SINCE 1900

6410 HAWTHORNE AVE. CLEVELAND, OHIO

FULLY MACHINED MAINTENANCE BARS • STANDARD STOCK BEARINGS • SPECIAL BEARINGS TO MEET ANY REQUIREMENTS

4,000 pounds, in which 3,500 is the constant used by automotive engineers. The number of full blanks contained in any length of strip, say 8 ft. long, is as follows:

[96 in. — (2¼ in. + 1⅞ in.)] ÷ **C** + 1. See Fig. 10.

Die Block and Jig-boring Design

Figure 11 illustrates the procedure to be followed in designing the die block and of showing the jig-boring layout. Since wings **P**, Fig. 7 are formed after piercing the holes in the flat blank, these holes will not be exacty opposite one another after forming. If necessary to correct this fault, the holes should be pierced about 0.010 in. undersize, and then line-reamed after forming the wings. An inexpensive jig can be used for line-reaming.

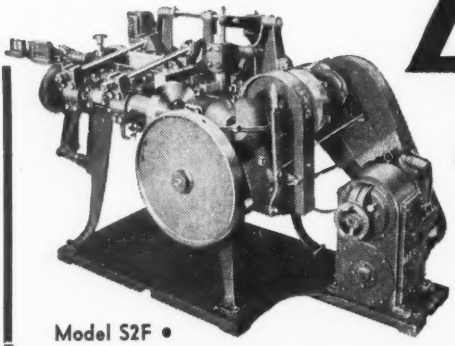
The drilling and boring of eight ⅜ in. diameter holes serves to locate the square corners of the blank in the die block. Notice that the circumferences of these holes are tangent to the sides and ends of the die opening perimeter. The holes provide openings through which a band-saw may be operated when sawing out the die opening.

The centers of all exterior radii must also be located and drilled. In the die block shown in Fig. 11 are four 0.125 in. diameter holes drilled ⅛ in. deep. Subsequently, hardened steel buttons are made with body diameters of **2R**, and with shouldered centers of 0.125 in. diameters. The buttons are press fitted in the four holes and used as filing templates for radii **R**.

To design the die block, position and draw the blank full size, as it will appear symmetrically located within the die block plan. Die block thickness may be only ⅝ in. for a low production job, or 1⅜ in. for blanking medium sized parts in high production. About 0.005 in. is ground from the die block face

How are things Shaping Up?

THERE'S NOTHING LIKE A **NILSON** FOR **ACCURATE FORMING!**



Model S2F •

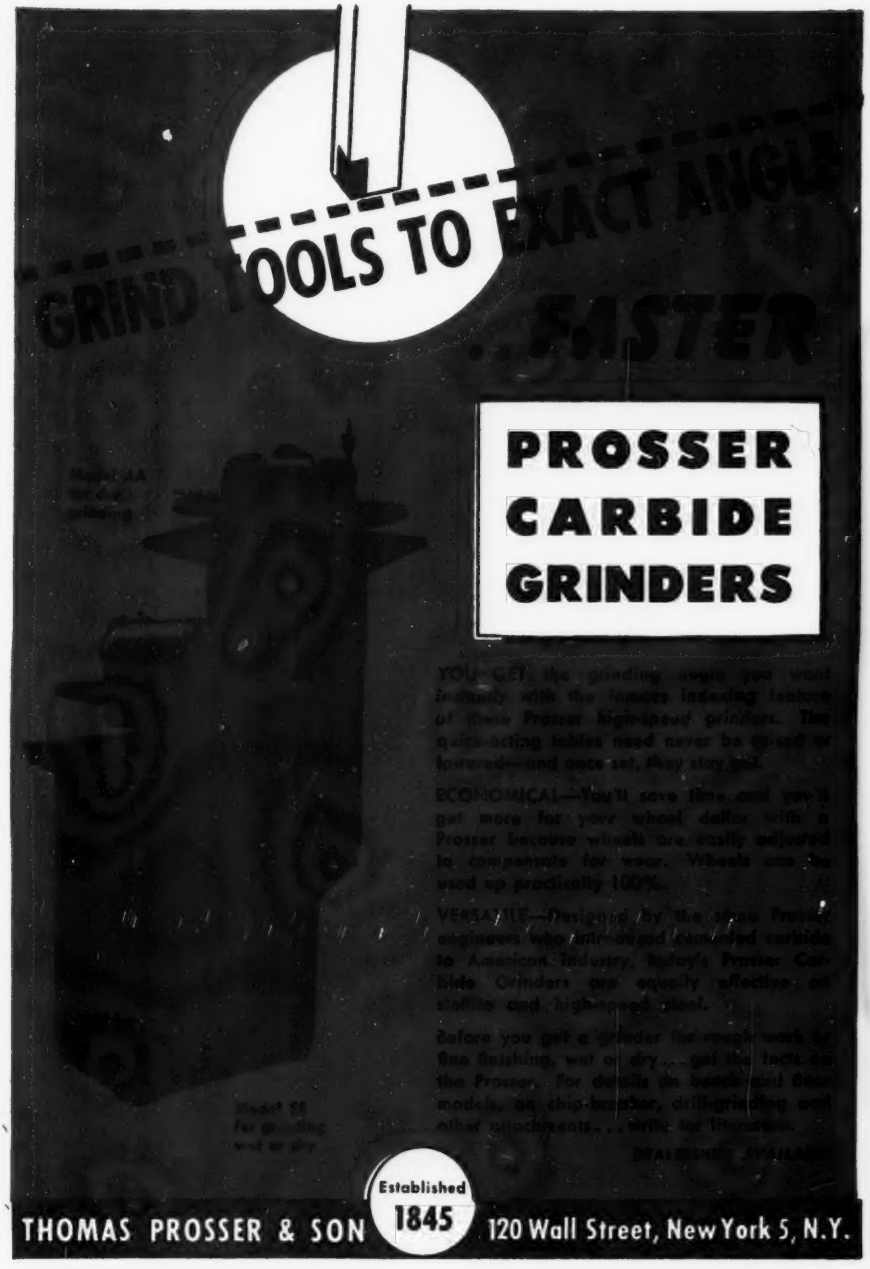
Nilson Automatic Four Slide Machines are adaptable to stamping and forming Wire and Metal coiled stock.

Assures high output of a wide range of small parts at low cost through one-operation production.

The **A. H. NILSON MACHINE CO.**
BRIDGEPORT 5, CONN.

Automatic Wire and Metal Forming Machines • Staple Forming Machines • Chain Making Machinery • Foot and Power Presses • Wire Reels • Wire Straighteners.

SPECIALISTS IN WIRE FORMING EQUIPMENT FOR OVER 50 YEARS


OOLS TO
FASTER
PROSSER
CARBIDE
GRINDERS
YOU GET the grinding angle you want instantly with the famous indexing feature of these Prosser high-speed grinders. The quick-acting tables need never be ground or lowered—and once set, they stay put.
ECONOMICAL—You'll save time and you'll get more for your wheel dollar with a Prosser because wheels are easily adjusted to compensate for wear. Wheels can be used up practically 100%.
Before you get a grinder for rough work or fine finishing, wet or dry . . . get the facts on the Prosser. For details on bench and floor models, on chip-breaker, drill-grinding and other attachments . . . write for literature.
Established
1845
THOMAS PROSSER & SON
120 Wall Street, New York 5, N.Y.

famco Model "612"
METAL CUT-OFF BAND SAW
Offers New Design Features

● Truly a finished machine tool, the Famco "612" Metal Cut-Off Band Saw cuts all shapes, all types of metals. It's ruggedly built of semi-steel castings and alloy steel. Cast aluminum guards provide extra safety. Capacities up to 6" round and 6" x 12" rectangular stock. Made in the typical Famco tradition of "the highest quality machine for the money."

A Few Famous Famco Features

Open construction for easy access; microset stock stop for quick setting, precision sawing; ⅝" x .032 blade; coolant system added in a jiffy; improved design means easier blade changes; Timken roller bearing equipped transmission; quick setting guide arms; blade guard telescopes automatically; 50, 100, 175 and 300 FPM cutting speeds; vise jaws adjust to 45° angle.

Write for Free Catalog

Complete information, including models, specifications and new design features, is available in a new illustrated catalog. Send for your copy today!

FAMCO MACHINE CO.
1324 18TH ST., RACINE, WIS.

famco (COST CUTTING) machines

ARBOR PRESSES • DRILL PRESSES • METAL CUT-OFF SAWS
POWER PRESSES • FOOT PRESSES • SQUARING SHEARS

during resharpening. High production blanking dies are often reduced by repeated grindings until they fail by fracturing. The die block may be used even after being reduced to ⅜ in. thickness.

The cutting edge in a die block nearest to the outside edges of the block should not be less than the thickness of the block, and 1½ thicknesses are necessary to use for some large-area blanks. The die block should be provided with four tapped holes for mounting screws, and two dowel pin holes, ground for press fitting. All these holes should extend through the block. Diameters of mounting screws should be approximately one-half the die block thickness for blocks under ⅞ in. thick, and 40 per cent of the block thickness for heavier blocks. Socket-head screws are best to use. Dowel pin diameters should be equal to the root diameters of the screw threads.

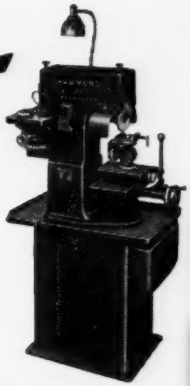
The next article will continue with various types of scrap-strip designs for progressive dies, and for dies used in high-speed presses.

"I'm Forelady, Aren't I? So I Want to Rearrange the Machines Again!"

Hammond

OF KALAMAZOO

CARBIDE TOOL AND CHIP BREAKER GRINDERS



CB-77 Chip Breaker and Diamond Finishing Grinder

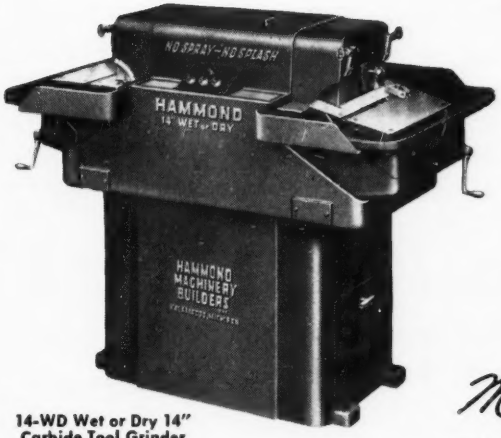
Save

TIME

TOOLS

WHEELS

WD-10 Wet or Dry 10" Carbide Tool Grinder



14-WD Wet or Dry 14" Carbide Tool Grinder

Hammond Carbide Tool Grinders will soon pay for themselves thru greater wheel economy, longer tool life and FASTER grinding. They relieve toolroom bottlenecks and step up production. **Write for Carbide Grinder Catalog 220.**

Hammond Machinery Builders INC

1615 DOUGLAS AVE. • KALAMAZOO, MICH.

INTERNATIONAL HARVESTER KEEPS MILLING MACHINES PRODUCTIVE WITH RUSNOK MILL HEAD

MILWAUKEE WORKS; INTERNATIONAL HARVESTER CO. uses RUSNOK Mill Head as a vertical attachment on one of their milling machines. In this operation, it is milling a boss on the side of an International Harvester Diesel pump housing.

RUSNOK heavy duty Mill Head quickly and easily converts your horizontal mill to do vertical or angular milling, drilling and boring operations. RUSNOK Milling Attachment takes the place of costly, special equipment — uses no valuable space, just install on your present mill.

Write for name of nearest RUSNOK Mill Head dealer. Let him show you how the RUSNOK Milling Attachment can be an important part of all your milling operations.

A Few Choice Dealerships Are Still Available

HEAVY DUTY **RUSNOK** ATTACHMENT

MILLING • DRILLING • BORING

RUSNOK TOOL WORKS • 4840 W NORTH AVENUE • CHICAGO 39, ILL

FOR TWIST DRILLS AND REAMERS:

GIVE BESLY A TRIAL... And CHECK Your RESULTS

High Precision

Besly High Speed Twist Drills and Reamers are manufactured to highest precision standards . . . perfect companions in performance to Besly Taps . . . *"the world's most accurate."* Available in any size for any specific job.

Better Cutting

Besly High Speed Twist Drills and Reamers can help you get better cutting tool performance at lower costs. Consistently smoother chips indicate greatest cutting efficiency.

Faster Production

Engineered for specific cutting jobs, Besly Twist Drills and Reamers deliver fast production. A trial will convince you they last longer, cut better . . . at any speed or feed.

Ask your Besly Distributor to prove to you that you can get more holes per grind with precision engineered Besly Twist Drills and Reamers. A trial will prove to you the economy of always specifying Besly.

BESLY

TAPS—the world's most accurate tap.

TWIST DRILLS AND REAMERS —Complete line for every need.

TITAN ABRASIVE WHEELS AND DISCS—individually formulated for your job.

GRINDERS that reduce costs on every type of surface grinding.

CHARLES H. BESLY & COMPANY

124 N. Clinton Street • Chicago 6, Illinois
Factory: Beloit, Wisconsin

Karl F. Kirchhofer

Sales Hints for the Smaller Shop

A discussion of the use of direct mail as a medium of obtaining business orders.

By Karl L. Kirchhofer

FEW media may be adapted to sales promotion problems of the smaller metal-working plant as easily as direct mail in any of its forms. Direct mail pieces vary from ordinary sales letters sent out on company letterhead paper to elaborate brochures or complete catalogs which tell the full story of a plant's products and services.

It is my feeling that every business in the metal-working industry, or in any other line of work for that matter, should conduct a continuous all-year-round direct mail campaign sending out at least six or more mailing pieces each year, depending upon the size of the business, the products, and the markets. This rule-of-thumb applies to small ten-man shops as well as to larger plants having their own sales and advertising departments. In most large plants, the value of direct mail is fully realized; and direct mail of all types is distributed, including salesmen's and dealers' aids, house organs, catalogs, folders, and various other pieces for sales promotion programs.

A number of books have been written on the subject of direct mail, and several leading universities conduct extensive courses on the subject. There is enough material on direct mail as applied specifically to the metal-working field to fill dozens of columns such as this one. In this article we are singling out for discussion a form of direct mail that is used extensively in every line of business—the self-mailer, the mailing piece that is everything in one, that gives illustrations of a product or products in use, sales talks, testimonials, specifications, drawings, order blank, and whatever else is required to put over a story.

I have used hundreds of self-mailing pieces in the past 20 years; and I have not yet found any shop or plant, wholesaler or retailer, manufacturer or service organization, that could not profitably include a few self-mailers in a direct mail program for any given year. One of the most popular and effective formats employed is a 9 x 12 inch light cardboard stock printed on both sides and folded twice.

The folded sheet is sealed with a precancelled postage stamp and mailed

The Men with the Holes in their Heads!

Big holes! Little holes! Deep holes! How can we bore 'em better for less? This may be your problem occasionally. But boring holes at lower cost is the full time problem for Madison engineers. This specialization can save *you* money just as it is doing every day for leading manufacturers. Why not take advantage of the two big things — Madison experience and Madison tools — that can cut cost on your production boring jobs. You're welcome to put another hole in one of our engineers' heads. Ask them to consider your problem and come up with a cost lowering idea. No obligation, of course.

BETTER BORING TOOLS

Madison Cutters in Madison Bars . . . the best in boring tools. Madisons give you superior finishes, in most cases cases equalled only by grinding. Tolerances to .0003. Two-bladed cutter that expands to make up for wear in regrinding — also quickly changed from one size to another with no disturbance of the set-up. Cutter floats in the bar — no special floating tool holders needed. More holes per cutter before regrinding and more regrinds per cutter (about 10 times as many as similar tools) . . . and many other original Madison features of design.

MORE BORING EXPERIENCE

For 35 years Madison has concentrated on solving boring problems. With this background of experience applied to your production job, you can count on the best solution to save your money. What's more, you can count on a recommendation based on a complete line of boring tools.

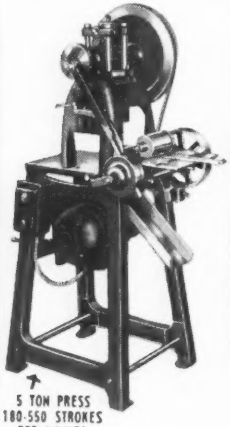
Write for the information filled Madison Catalog. It is yours for the asking.

MADISON MANUFACTURING COMPANY
DEPT. MM MUSKEGON, MICHIGAN

in accordance with the Section of the Postal Laws and Regulations, pertaining to third class mail.

There is quite a bit of competition for readership in the mails today. Mailing pieces of all kinds, shapes, and sizes vie for a recipient's attention. Therefore, an important consideration is an attention-compelling headline on the outside of the mailing piece. The headline should grip your prospect's imagination and force him, by the implication contained in this introductory material, to open the folder and read on.

The following is a description of a typical self-mailing card which produced many inquiries and orders for a company in the metal-working field that deals largely in specialties which are sold both through the mails and at requested demonstrations. Requests for demonstrations are largely the results of a wide-spread distribution of self-mailers. The card under discussion was a two color job produced in green and black. Frequently, the use of color adds enormously to the appeal and effectiveness of a self-mailer and is well worth the additional cost. The use of color helps to relieve the drabness and monotony of black and white.



5 TON PRESS
180-550 STROKES
PER MINUTE

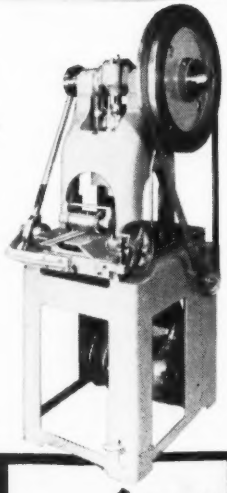
$1250.00 INVESTMENT RECOVERED IN 83 WORKING DAYS

with **DIEBEL *HI-SPEED* AUTOMATIC PRESS & DIE***

Production was boosted from 52,000 pieces to 95,000 pieces per day. Maintenance charges were reduced and floor space requirements cut. Costs were permanently lowered and a better competitive position reached. This is what a manufacturer accomplished by replacing conventional equipment with our Hi-Speed Automatic Press.

Ask Us What We Can Do For You

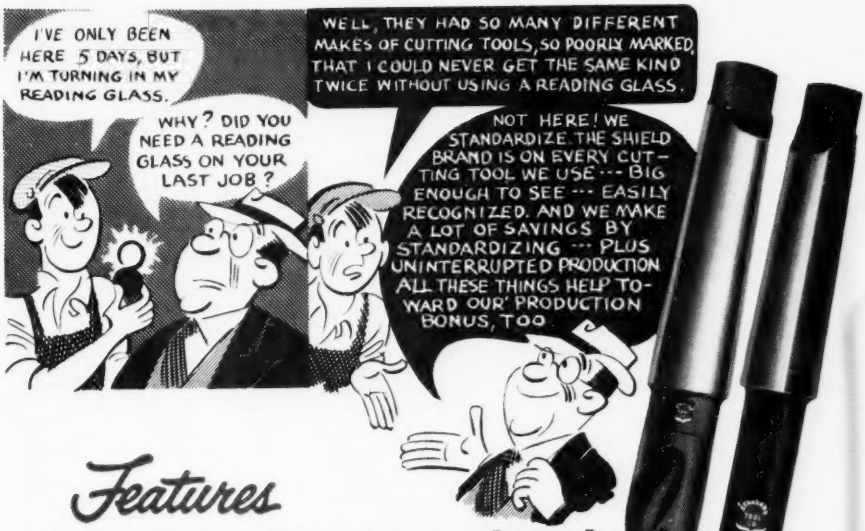
*Die designed and built in our modern tool room.



12 TON PRESS
65-300 STROKES PER MINUTE

DI MACHINE CORP.
2714 IRVING PARK ROAD, CHICAGO 18, ILL.

This particular self-mailer was sent out in an effort to promote the sale of a comparatively new method of removing broken taps, drills, and studs from castings and other parts without damaging threads so that the parts might be salvaged instead of being discarded as scrap. On the outside of the mailer, to the left


I'VE ONLY BEEN HERE 5 DAYS, BUT I'M TURNING IN MY READING GLASS.
WHY? DID YOU NEED A READING GLASS ON YOUR LAST JOB?
WELL, THEY HAD SO MANY DIFFERENT MAKES OF CUTTING TOOLS, SO POORLY MARKED, THAT I COULD NEVER GET THE SAME KIND TWICE WITHOUT USING A READING GLASS.
NOT HERE! WE STANDARDIZE. THE SHIELD BRAND IS ON EVERY CUTTING TOOL WE USE --- BIG ENOUGH TO SEE --- EASILY RECOGNIZED. AND WE MAKE A LOT OF SAVINGS BY STANDARDIZING --- PLUS UNINTERRUPTED PRODUCTION ALL THESE THINGS HELP TOWARD OUR PRODUCTION BONUS, TOO.

Features of Standard Shield Brand Tools

1. Foremost Quality—In design—workmanship—material. **2. Complete Line**—One reliable source of supply for drills, reamers, taps, dies, milling cutters, end mills, hobs, counterbores, and special tools. **3. Complete Service Stock**—Over 10,000 items regularly carried in factory stock. **4. Nation-wide Availability**—Stocked and supplied by leading Mill Supply Distributors coast to coast. **5. Men Who Know Their Business**—Our service staff has the advantage of 68 years of accumulated experience in solving tough problems.

Standardize on Shield Brand Tools for uniform cost reducing performance

STANDARD TOOL CO.

CLEVELAND 4, OHIO

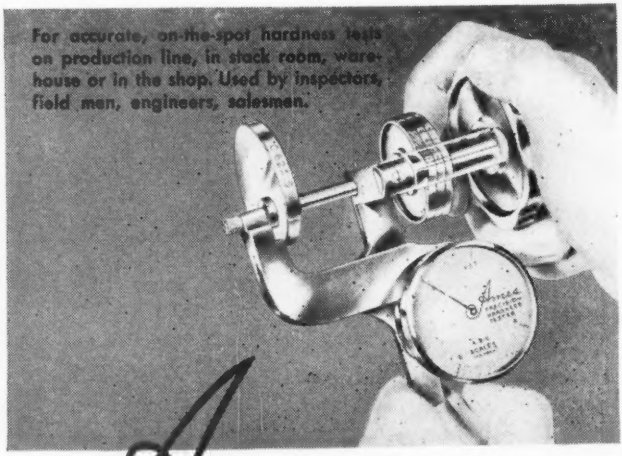
New York • Detroit • Chicago

THE STANDARD LINE: Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Hobs • Counterbores • Special Tools

of the recipient's name and address, the headline, "SAVING PARTS CONSIDERED LOST" was printed in boldface type; and along with the headline, there was a good-sized illustration of a mechanic actually using the equipment to remove a broken tap from a casting.

As a reader of MODERN MACHINE SHOP, and as to a practical shop man having been faced with the problem of removing broken cutting tools, you undoubtedly would have been sufficiently interested to want to read further. Inside, the headline at the top of the card read, "How the (Name of Product) Tap Removing Method Helped Save an Ordnance Contract". And since this mailing piece was sent out during the war years when every metal-working plant was producing ordnance or some form of war material, you can understand why every plant official would want to read on.

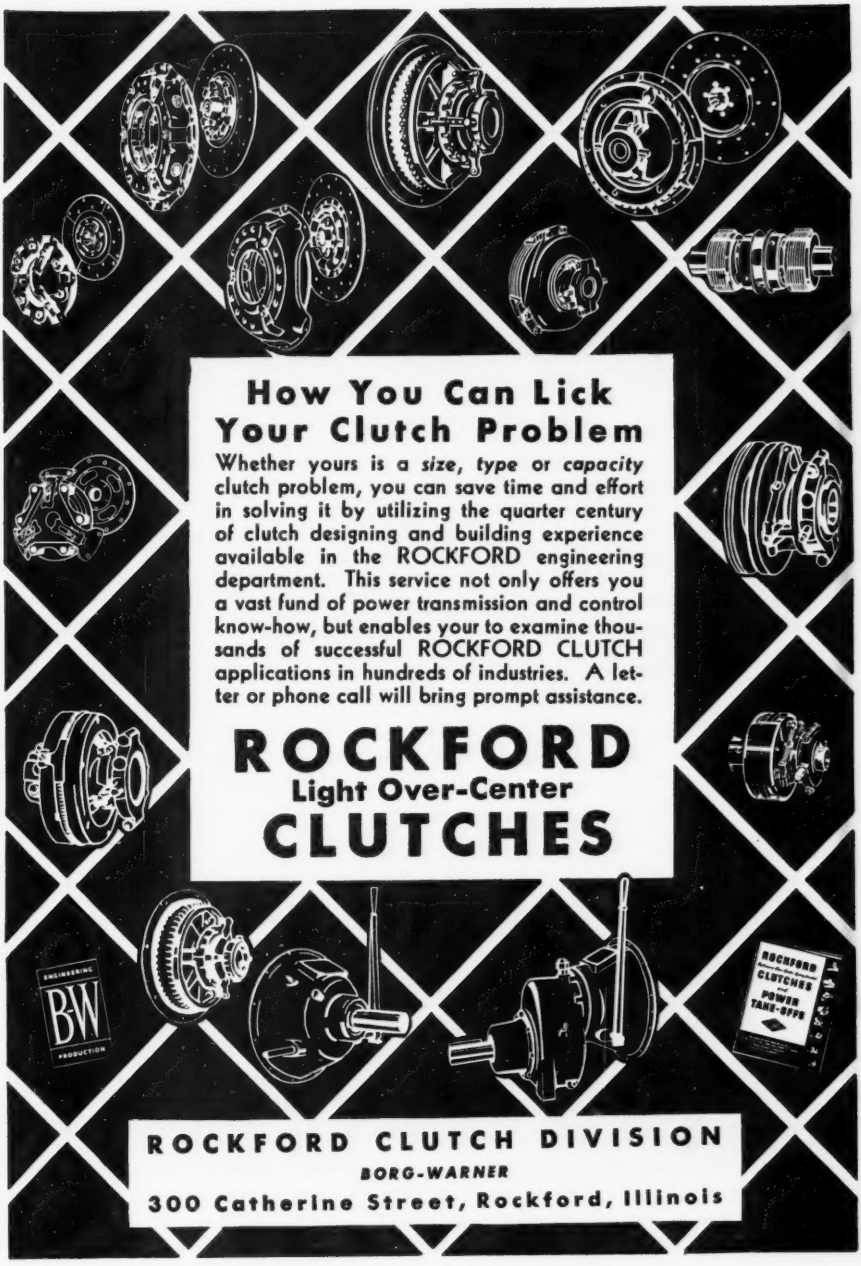
Underneath the inside headline and in a dramatic way an actual case history was presented of how a Chicago manufacturer producing a new model combat tank was able to deliver an order on time by using the described equipment. Below that dramatic introductory example, the complete story of the tool removing process was discussed. There were four paragraphs of explanation which were headed by the following captions: "Broken Taps Cause Serious Loss", "Salvaged Thousands of Pieces", "Expensive Hardened Dies Have Been Saved", and "Investigate Method On Your Own Work". In addition to this


For accurate, on-the-spot hardness tests on production line, in stock room, warehouse or in the shop. Used by inspectors, field men, engineers, salesmen.

Ames
PORTABLE
HARDNESS TESTERS

Amazing savings in time and expense can be realized by taking the Ames Hardness Tester to the work. For hardness testing flat or round stock, tubing, duplicate parts, knives, saws and irregular shaped pieces, reading directly in the Rockwell Scales. No cutting off specimens. No laboratory delays. Complete with wooden carrying case. Several sizes. Write for bulletin.

AMES PRECISION MACHINE WORKS
Makers of Precision Bench Lathes & Milling Machines
WALTHAM 54, MASSACHUSETTS


How You Can Lick
Your Clutch Problem
Whether yours is a size, type or capacity clutch problem, you can save time and effort in solving it by utilizing the quarter century of clutch designing and building experience available in the ROCKFORD engineering department. This service not only offers you a vast fund of power transmission and control know-how, but enables your to examine thousands of successful ROCKFORD CLUTCH applications in hundreds of industries. A letter or phone call will bring prompt assistance.
ROCKFORD
Light Over-Center
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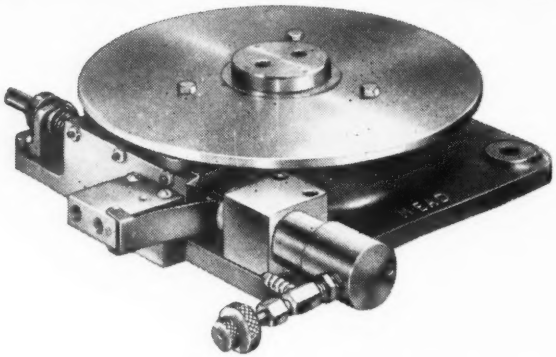
POWER
TAKE-OFFS
ROCKFORD CLUTCH DIVISION
BORG-WARNER
300 Catherine Street, Rockford, Illinois

descriptive material, there were three illustrations showing the product in use, and an illustration of a tap that had been removed by this process, underneath which was the caption, "Tap Breaks Up into Four Parts and Is Finally Removed without Damage to the Threads".

A business reply card was provided and set off by perforations at the lower right hand corner of the sheet in order to enable prospects to send for further information, quotations, and complete literature. On the back of the sheet and alongside the business reply card, which naturally had to be torn out to be mailed, there was included a headline, "Some Prominent Users" and a list of outstanding metal-working concerns that were already using the method. Thus, here in one self-mailing piece, there was the complete story of a process. It was an economical photo-offset job that might well be copied, in some form by thousands of small metal-working plant owners who are seeking effective, as well as economical, direct mail methods of selling their goods and services.

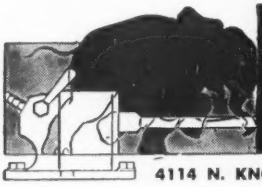
Any good creative printer can help you, the shop man, in telling the story of your products, goods, and services in self-mailing devices that SELL GOODS AND BRING ACTUAL ORDERS. I have heard people say, "Direct mail? It only goes into the waste basket." True, much of it does; and, as a matter of fact, most of it does. But you only need a few orders, or an extremely small percentage of return on your entire mailing list

Air Operated
ROTARY WORK FEEDER



Deftly holds and delivers small parts to drill, tap, swage, stake, etc. Stations accurate to .002". Guaranteed against over-travel or "skipping." Indexes as slow or fast as you like, up to 10,000 per hour. Compact and sturdy, easy to tool and hook up.

Standard dial plate 10"; available in 12". For a new job, simply tool up a new dial. Readily combines with "MEAD-MATIC" Timer, Air Hammer, Air Press, Drill Presses, etc.— to make almost completely automatic machine — operator merely loads. Write for full details.



MEAD
SPECIALTIES COMPANY

4114 N. KNOX AVE., DEPT. AA-30, CHICAGO 41, Ill.

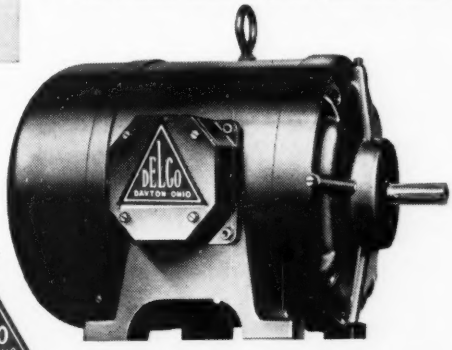
On more and more spec sheets . . .

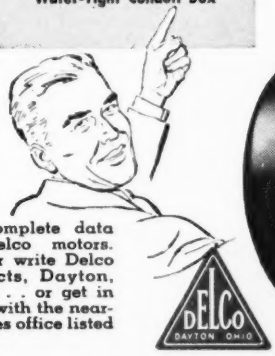
Delco preferred!

- Positioned Bearings
- Delcote Coil Insulation
- Corrosive-Resistant Cast Iron Frame
- Positive Lubrication
- Dynamically Balanced Rotor and Shaft Assembly
- Water-Tight Conduit Box

Two words that mean top motor performance

You see the words "DELCO PREFERRED" on more and more spec sheets. That's because Delco motors are built the way production men want motors built. They are rugged, dependable, and made of the finest materials. A few of the performance extras that Delco motors give you are listed here:





Get complete data on Delco motors. Call or write Delco Products, Dayton, Ohio . . . or get in touch with the nearest sales office listed below.

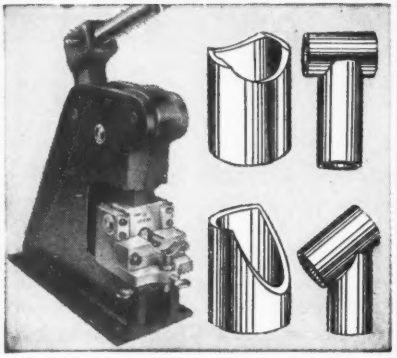
DELCO
DAYTON OHIO

DELCO MOTORS

DELCO PRODUCTS, DIVISION OF GENERAL MOTORS CORPORATION, DAYTON, OHIO

SALES OFFICES: CHICAGO • CINCINNATI • CLEVELAND • DETROIT • HARTFORD, CONN.

NOTCH
TUBING OR PIPE
in 5 Seconds
WITH
ARC•FIT



Faster than old methods which take from 10 to 20 minutes more, this patented shearing tool forms a joint for brazing or welding with no deformation of pipe or tubing.

The Arc-Fit quickly shears away the desired sections of pipe so that it will conform perfectly to the outer contour of the opposing piece, as illustrated.

Eliminates the need for grinding or finishing.

Made in standard pipe sizes up to 2", it can be used in the 90 lb. Arc-Fit hand press as shown or in your own power punch press.

Arc-Fit can also be supplied to meet specifications for special notching jobs.

Learn about Arc-Fit today. Write for NEW ILLUSTRATED FOLDER. Dept. MM.

Manufactured Exclusively By

Vogel TOOL & DIE CORP.
2529 W. MOFFAT ST.
CHICAGO 47, ILLINOIS

in order to show a profit. In many cases it is sufficient if only two out of a hundred, or just two per cent, buy; the rest of the distribution may be considered as free advertising.

Do not forget that the addition of only a few new accounts may over a period of a number of years be worth thousands of dollars to you in business. And do not believe that everybody throws printed matter away. I personally have received orders from self-mailers that were sent out as long as five years ago. Again, remember that the most effective mailing piece in the world will not pay for itselt if your mailing list is wrong. And this brings us to the subject of next month's column, "How to Build Up and Select Your Mailing List". Watch for "Sales Hints for the Smaller Shop".

Gas Turbine Utilizes Kentanium Parts

A 200 h.p. gas turbine in which important parts are made of Kentanium, a unique heat-resistant material recently placed on the market, is now under development by Kennametal Inc. The turbine will be built and tested in the company's plant at Latrobe, Pa., as a special service to potential users of Kentanium in this particular field.

By constructing the main turbine elements of Kentanium, which has high resistance to oxidation, retains unusually great strength at elevated temperatures, withstands thermal shock, and is light in weight, it becomes feasible to operate such equipment at 2,000 deg. F. and thereby attain much greater efficiency. Maximum horsepower can thus be developed in a lighter, more compact unit than has been possible heretofore.

The project is under the direction of John McVeigh, who has specialized in gas turbine design for the past six years, and immediately prior to joining the technical staff of Kennametal Inc. was project engineer with Continental Motors Corp., Detroit, Mich., in charge of all gas turbine development.

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.

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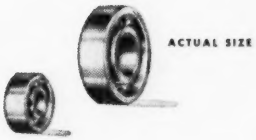

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Geiger Counter Employed in Steel Analysis Method

THE Geiger counter, famed for its ability to detect uranium and other radioactive materials, and also as an aid to nuclear physicists in atom-smashing development, has found a new and extremely useful job in the metal-working industry.

It has been adapted by scientists of the Research Laboratory, United States Steel Corporation of Delaware, to the development of a quick and accurate method of analyzing steel samples. After careful calibration for many specific problems, many of which are yet to be solved, Geiger counter analysis is expected to be even faster than the direct-reading spectrograph, which is itself a recent development in metallurgical analysis. In the laboratory studies, it is used in conjunction with special spectrographic equipment and has achieved a measure of success in revealing quickly the kind and quantity of alloying elements in steel.

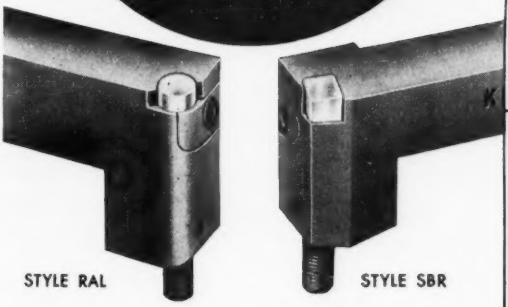
This does not mean that the chemical elements which are combined with iron to make steel are radioactive, as might be inferred from the Geiger counter's more celebrated job. As it is capable also of measuring invisible fluorescent rays, each of a special kind, that emanate from a steel sample when its atoms are ionized by powerful X-ray.

The sample's iron atoms and the atoms of alloying elements are not smashed in the analysis process, as might be expected. In fact, the steel sample is in no way harmed or changed.

In many ways it is really simpler to make a Geiger counter analysis than an ordinary chemical or a spec-

Atomic age cuts back through centuries as a technician at the Research Laboratory, United States Steel Corporation of Delaware, uses a Geiger counter to analyze steel forged into the blade of a medieval, two-handed sword. Powerful X-rays from vertical tube at left ionize atoms of iron and alloying elements that compose the serrated blade, making them fluorescent. The Geiger counter, on quarter-circular track, identifies and measures intensity of rays. One great advantage is that the steel specimen needs no special preparation and remains intact.

Saves $34,560 IN ONE YEAR with KENNAMETAL TOOLING



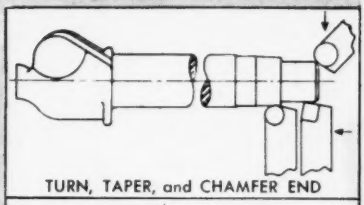
STYLE RAL STYLE SBR

A manufacturer of automotive steering gears effected annual savings of $34,560.00 by using Kennametal tooling on just one series of machining operations.

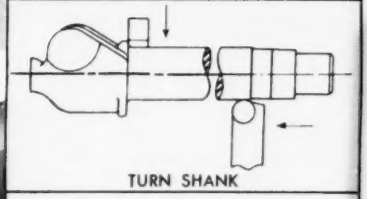
Details of the job are given at the right—the basic tools used, Styles RAL and SBR, are illustrated above. This report indicates the enormous savings attainable through the application of modern tooling.

Here again Kennametal proves its worth. A few pennies saved in the initial cost means nothing. Consider these facts: (1) Fewer tools are required, as a rule; (2) Set-up and machine downtime are minimized; (3) Load and confusion in grinding room is reduced; (4) Higher production rates can be reached, and maintained.

Ask us to send you performance reports that show how other shops are achieving cost reduction by tooling with Kennametal.



TURN, TAPER, and CHAMFER END



TURN SHANK

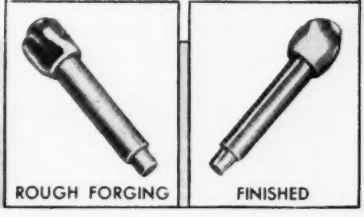
The operations illustrated above required ten single-point brazed tools. Four Kennamatic tools are now being used. The savings on each 1000 pieces machined is $24.00, as detailed below. A total savings of $34,560.00 was realized over a 12-month period.

TOOL PERFORMANCE

	Single-Point	Kennamatic
Number Required	10	4
Cost Each (Avg.)	$2.50	$4.10
Pieces/Grind	200	1,600
Pieces/Tool Life	2,000	24,000

SHOP COST/1000 PIECES

	Single-Point	Kennamatic
Tool Cost	$15.00	$ 1.93
Productive Labor	15.12	9.32
Non-Productive Labor	6.00	0.87
Shop Cost/1000 pcs.	$36.12	$12.12



ROUGH FORGING FINISHED

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trographic analysis of steel. Almost any piece of steel that has a flat surface will do for the purpose, so long as it is reasonably clean. Thus analysis might be made of a random section of steel rail, the bottom of a cooking pot, a knife blade, or a flattened mass of steel file dust.

A 20-milliampere, 50-kilovolt, molybdenum target X-ray tube is used in the United States Steel laboratory studies. The ray floods the steel specimen, exciting secondary rays which are characteristic of the chemical elements alloyed with iron in the sample. These fluorescent rays are reflected through a narrow slit at right angles to the path of the primary X-ray to a crystal monochromator. This crystal is in the center of a circle one-fourth of whose circumference is traversed by the Geiger counter in its round of analysis. The counter is moved by motor in this scanning operation.

When used by a prospector for detecting radioactive substances in nature, the counter indicates their presence by clicks which can be counted accurately. The instrument used in the Kearny laboratory has a counting circuit, like other laboratory counters. In this case, however, the counter has been connected to a standard recording instrument, a self-balancing "potentiometer," which automatically plots the intensities of the various elements on graph paper.

This method of analysis is best adapted to detect and measure elements of "middle" atomic weight.

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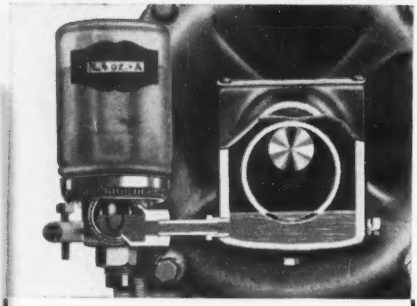

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Among these are the elements most often combined with iron and carbon to form the various steels in common use—chromium, manganese, molybdenum and nickel, as well as copper, which is frequently added to a steel composition to lessen corrosion. Also included in this class of alloying elements are some whose use is growing more and more frequent, such as columbiun, titanium, tungsten and vanadium.

The usefulness of this new and fast method of steel analysis is readily apparent. It promises great advantages in the laboratory, where many determinations of chemical content are necessary. Still more important will be its usefulness, when fully articulated, in steel operations. Here it is necessary for the operator of a steel-making furnace to know quickly, at various steps of his furnace's heating cycle, whether he is getting the exact steel.

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.

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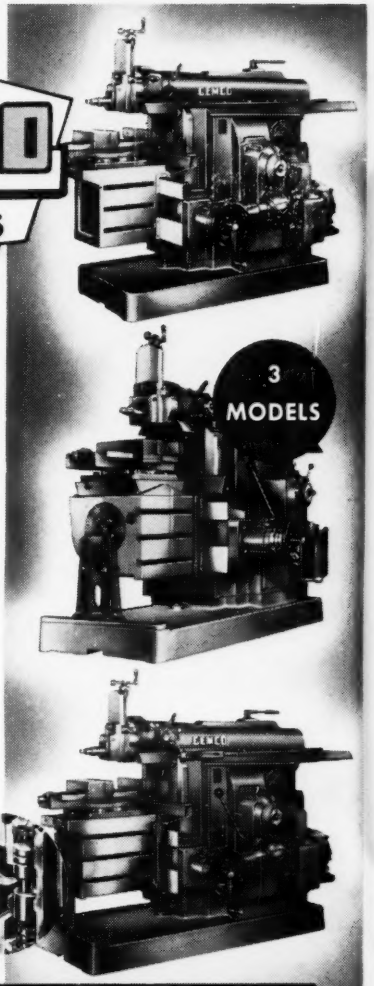

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GEMCO Shapers provide a 3-way efficiency...ruggedness, precision, adaptability. In 3 models... for average machine shop work (PLAIN); for heavy production work (PRODUCTION); for tool and die work, etc. (UNIVERSAL). IN SIZES FROM 16" TO 36" INCL.

In these New Model Universal Shapers, GEMCO engineers have incorporated new, additional features...

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WRITE FOR BULLETIN GC-135

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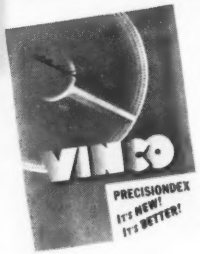

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A Practical Guide to Steel Selection

By NORMAN N. BROWN

Cincinnati Branch Manager, Wheelock, Lovejoy & Co., Inc.

THE modern machinist, engineer and designer recognizes the fact that improvements are constantly being made on machinery and other mechanical equipment and that these improvements invariably result in increasing demands upon the materials used in their manufacture. Many steels have been developed along with advanced heat treatments to meet the varied requirements of workpieces such as those shown in Figure 1. It is often difficult to select the right steel and it is the purpose of this article to present a general discussion of steels and their treatment which may simplify the problem for the job at hand.

Plain carbon steels satisfied most requirements in the early days of the machine age, but gradually the need for better and better material became apparent, so our modern alloy steels in both the "case hardening" and "through hardening" grades were developed. The "case hardening" steels refer to those under .25 per cent carbon which do not develop much hardness with the ordinary quenching treatments while the "through hardening" steels are those containing

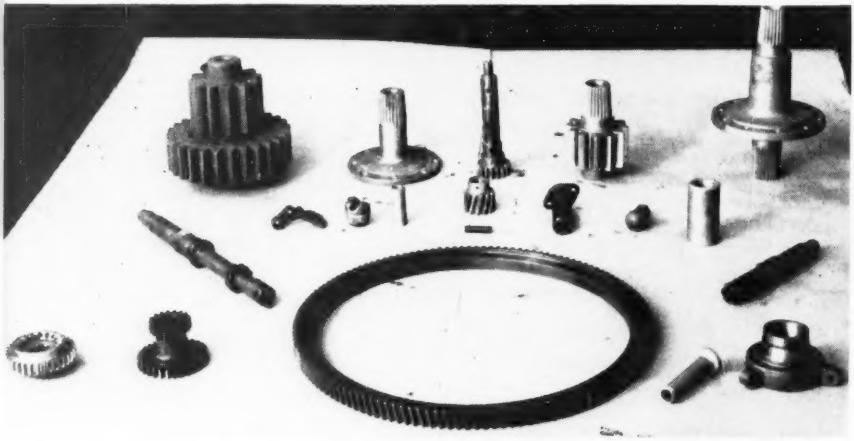


Fig. 1—Newly developed steels and advanced heat treatment methods provide necessary requirements for parts such as those shown here.

TABLE I—COMPARATIVE STEEL MACHINABILITY RATINGS

AISI. Spec.	Finish	Heat Treat	Brinell Hardness	Machinability (Per cent)
B1112	Cold	No	174	100
C1020	Hot	No	128	52
C1020	Cold	No	146	58
C1117	Hot	No	135	75
C1117	Cold	No	162	82
A1315	Hot	No	149	88
A1315	Cold	No	170	94
A2315	Hot	No	170	50
A3115	Hot	No	170	52
A4615	Hot	No	175	65
A4615	Cold	No	197	70
C1045	Hot	Ann.	175	62
C1045	Hot	Yes	235	50
C1045	Cold	No	210	60
C1137	Hot	No	190	75
A1335	Hot	Ann.	200	60
A2340	Hot	Ann.	201	51
A2340	Hot	Yes	302	28
A3140	Hot	Ann.	207	50
A3140	Hot	Yes	286	37
A4140	Hot	Ann.	183	55
A4140	Hot	Yes	285	38
A4340	Hot	Ann.	228	55
A4340	Hot	Yes	293	38
A3250	Hot	Ann.	228	40
A3250	Hot	Yes	302	29
A5140	Hot	Ann.	207	50
A5140	Hot	Yes	269	38
A6145	Hot	Ann.	205	49
C1095	Hot	Ann.	207	28
E52100	Hot	Ann.	228	35

Note—In the "Heat Treat" column "Ann." means Annealed. This chart should be used as a guide only as conditions will vary somewhat in different plants with different tools and different heats of steel.

more than .30 per cent carbon and which can be hardened with such treatment.

It has become quite common practice when referring to the carbon content of a steel to say "thirty" carbon for .30 per cent carbon, "fifty" carbon for .50 per cent carbon, and so on and the meaning is generally clear. Usually the lowest carbon content the steel will have is .08 per cent and the highest about 1.30 per cent.

Because of the necessity of overcoming the disadvantages of the fast water quench which is required in the treatment of plain carbon steels it was discovered that when alloying elements are added, the cooling rate necessary to harden and obtain the desired physical properties is slowed down thus reducing their tendency to distort; at the same time, the physical properties are usually improved over those of the plain carbon grades. In order to obtain the best results from alloy steels they should generally be used in the heat treated condition.

The **physical properties** of the part to be made, **price, processability,** and **availability** of the steel to be used are generally considered in making the proper selection of the material. The circumstances surrounding the use and manufacture of the particular part will

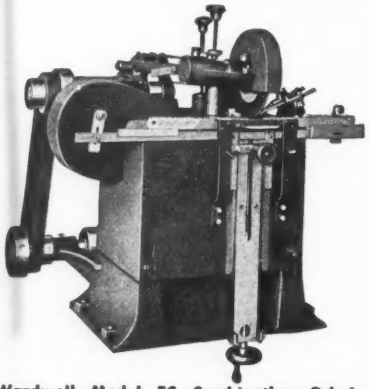
determine the importance of each point.

Under **physical properties** it has to be determined whether the part requires a steel that is tough, has wear resistance, torque resistance, fatigue resistance, and so on. Frequently a lot of guesswork is necessary on this point because the part may never have been made before; then, too, the part may be more or less overloaded in service. In such instances it is generally best to start with a steel of higher quality than absolutely necessary and experiment down from there.

Price may vary in importance from very little to a great amount. On a single part, such as a heavy duty stud or shaft, the cost of the steel may be small in comparison to other factors involved, but the material cost can be important in other cases.

Machinability and heat treatment are the important factors under **processability.** It is desirable to buy the best machining steel available in the class that satisfies the physical requirements, but it may be necessary to compromise because of price, heat treatment or other reasons. An example of this could be the use of an alloy such as A.I.S.I. A-3140 or A-4140 in place of A.I.S.I. C-1045. The C-1045 might be all right as far as machining and physical properties are concerned, but the distortion occurring because of the design and fast water quench in heat treating might result in the need for excessive, costly grinding. The alloy, while it may cost more and be somewhat more difficult to machine, will not distort as much in heat treatment and the subsequent saving in grinding costs could well result in a less expensive finished part than one made from C-1045.

Increasing the sulphur content in a steel is one of the common ways to increase the machinability, Prejudices against many of the steels in this class,



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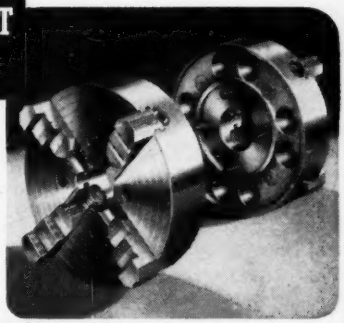

Models for medium and heavy duty tool room and general machine shop work. Available in sizes from 4½" to 36" with semi-steel, steel, or forged steel bodies. All other parts are heat-treated alloy steel. Jaws are solid reversible or two-piece with reversible tops for either internal or external gripping. The body surrounds more than 60% of each operating screw for the full length of the screw to assure proper alignment at all times.

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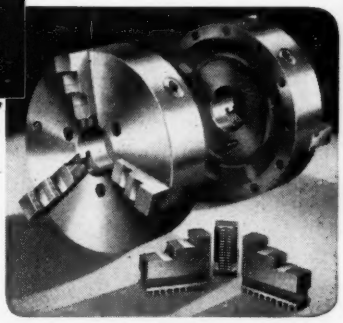
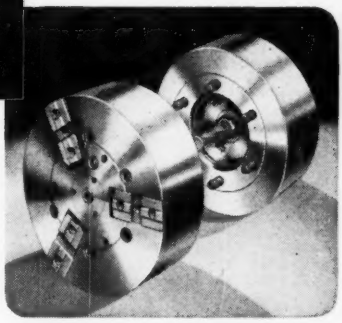


Self-centering models for light, medium and heavy duty jobs in tool room or for production runs. Available in sizes from 3" to 21" with semi-steel or forged steel bodies, and heat-treated alloy steel for all other parts. Provided with two sets of solid jaws or two-piece jaws for holding internal or external work. Lands on the jaw, jaw steps and end bites are ground after the chuck is assembled.

SKINNER POWER CHUCKS



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particularly in alloys, are gradually disappearing because modern metallurgical practice has overcome heretofore objectional features such as brittleness. Molydbenum is another element that aids machinability. Table I lists the relative machinability of several standard steels.

If heat treatment is required it is, of course, desirable to select a steel that will respond satisfactorily and produce the desired physical properties whether or not it is heated to the high side of the usual temperature treating range for the steel used. Most steels satisfy this requirement for most parts. However, the steel companies can now furnish steel (so-called "H" steels) tested to its exact hardening power (Jominy Test) which is of interest to those making critical parts on a production basis who wish to set up a definite heat treating procedure and use the procedure without changing from one lot of steel to another.

During World War II it was clearly demonstrated that, while it was quite possible to find one steel that might be considered best for a particular part, in most cases, more than one steel could be used with no appreciable sacrifice either financially or in physical properties. The list of A.I.S.I. steels is quite imposing, but many are still not readily available, especially from warehouse stocks. In the brief groupings of the standard steels; as shown in Table II, those in any one group may be used interchangeably in varying degrees depending upon the particular part being made.

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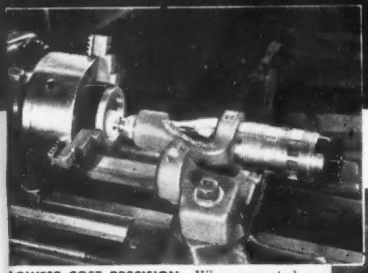

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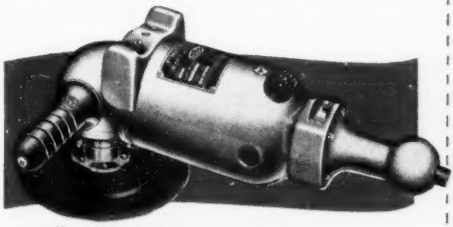

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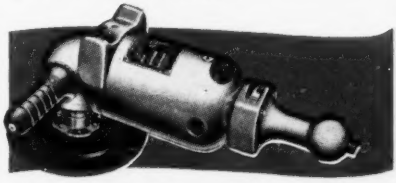

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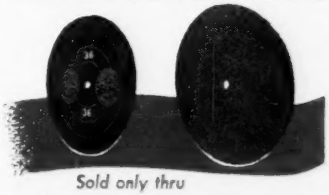

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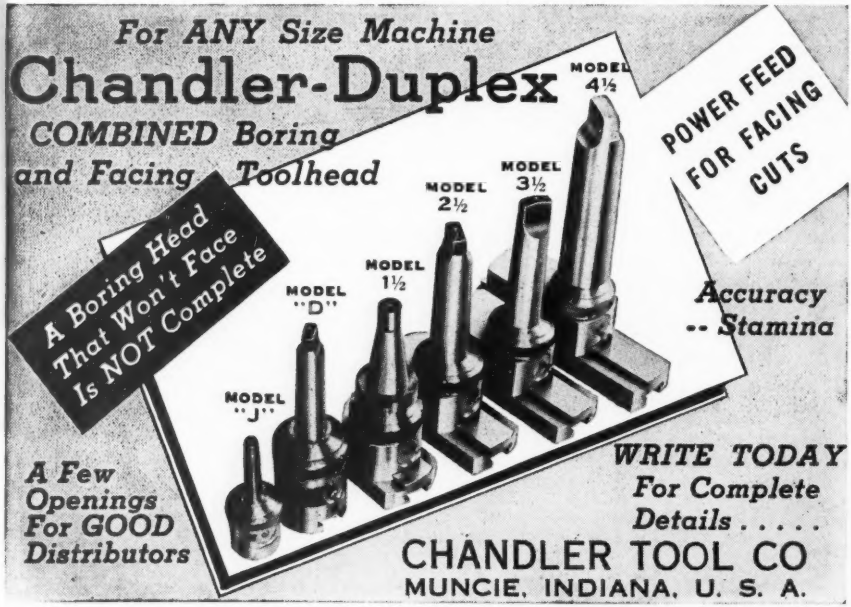
TABLE II

AISI	AISI	AISI	AISI	AISI
C1020	A2315-20	A1040-50	A3140-50	A4340
C1117	A3115-20	C1137	A4140-50	A3250
A1315	A4615-20	A1335	A5145	
	A5120		A6145	
	A8620		A8645	
			A8740-50	

A.I.S.I. numbers—American Iron & Steel Institute—are gradually replacing the S.A.E. numbers, i.e., AISI A-4140 in place of SAE 4140, AISI C-1045 in place of SAE 1045, and so on. The letter immediately in front of the number refers to the type of steel—"A" for alloy, "C" for carbon and "E" for electric furnace alloy.

Besides the standard steels there are many "trade name" steels on the market sold by reputable concerns which fill in the gaps in the standard setup as far as price and physical properties are concerned. Their price is in line with similar standard grades and often they are easier to obtain than many of the A.I.S.I. analyses. The latest advances in ferrous metallurgy frequently show up first in the "trade name" steels.

Before discussing the various types of steels it might be well to point out a popular misconception regarding deflection of shafts and other similar parts. The assumption by many that such a problem can be solved by the use of a better steel or heat treatment is wrong. Deflection is due to the fact



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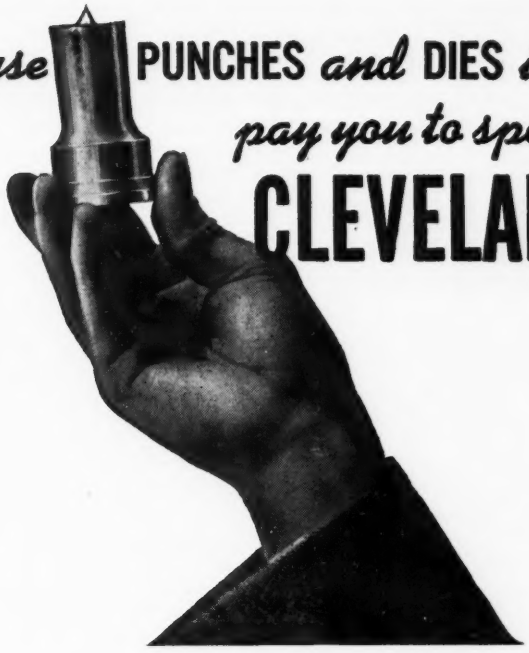

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that the modulous of elasticity is about the same for any given section and length of steel irregardless of the type or treatment used. In order to correct the bending of deflection, additional support must be provided or larger sized sections should be employed.

Another common difficulty, fatigue failure of a part, can frequently be reduced to the point where it is not necessary to go to a higher priced steel than the one being used by improving the design or by cold working or both. Fatigue vulnerability is greatly increased by poor fillet design or no fillets at all. Since failures of this nature always occur when stressed members are in tensoin rather than in compression it has been found that when compressive stresses are introduced on the surface of shafts or similar parts the resistance to fatigue is materially improved. These compressive stresses can be introduced by shot peening, shot blasting, or pressure rolling enough to plastically deform the surface layers of the shaft or fillet. Increasing the tensile strength by heat treatment will also help reduce fatigue failures, but often it is more practical and effective to increase the cross section of the shaft slightly.

No attempt will be made in this article to go into detail about individual steels, but rather to discuss the various types and their uses. The groups to be considered are (1) Low Carbon, (2) Medium Carbon, (3) High Carbon, and (4) Stainless Steels.

Steels ranging in carbon content from about .10 per cent to .25 per cent are classified as **Low Carbon** and they may be in the plain carbon or alloy class.

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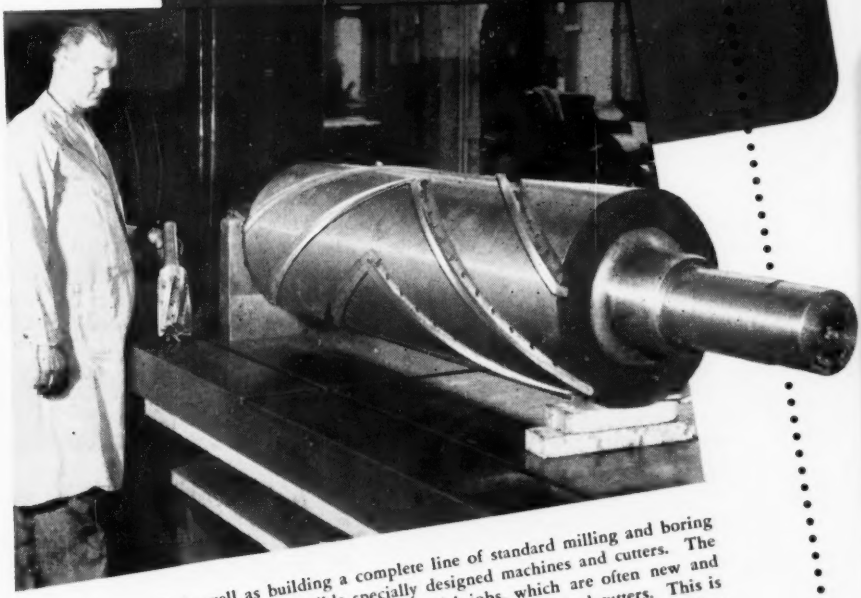

● As well as building a complete line of standard milling and boring cutters, Ingersoll builds specially designed machines and cutters. The experience gained in building special jobs, which are often new and unusual, is constantly being designed into our standard cutters. This is one of the reasons for the superiority of Ingersoll Inserted Blade Milling and Boring Cutters.

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TABLE III—AISI C-1020 HOT ROLLED AND COLD DRAWN

	Tensile Strength	Yield Point	Elong. in 2"	Hardness
Hot Rolled	65,000# psi.	40,000# psi.	36%	128 Br.
Cold Drawn	70,000# psi.	60,000# psi.	24%	146 Br.

Included in this group are two steels referred to by the average user as "Cold Rolled" and "Machine Steel" both of which are used for parts that do not require any particular strength. AISI B-1112 or C1020 in the cold drawn condition is generally supplied when "Cold Rolled" is requested, and C-1020 in the hot rolled condition is generally supplied when "Machine Steel" is requested.

When a steel has been cold drawn the tensile strength and yield point are somewhat better than when the same material is hot rolled, but the toughness as represented by the elongation and reduction of area is less. (See Table III.)

While the machinability of the cold drawn stock is better than the same material hot rolled, the cold drawn stock tends to distort more because of the strains induced by cold drawing and for this reason it is better to use hot rolled stock if much machining is involved. Cold Drawn steel is generally recommended for use in screw machine parts or parts on which the machine work is negligible.

The **plain, low carbon** steels (AISI C-1020, B-1112, V-1117, and so on) may be case hardened if wear resist-

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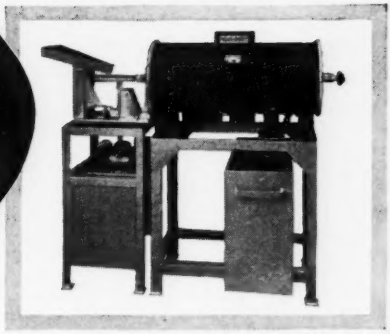

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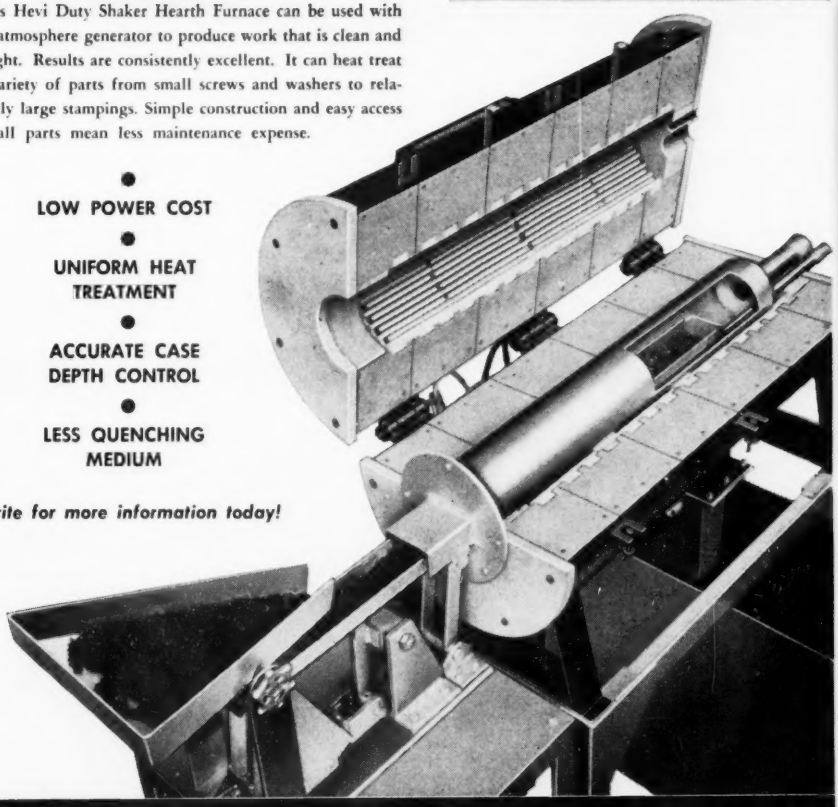

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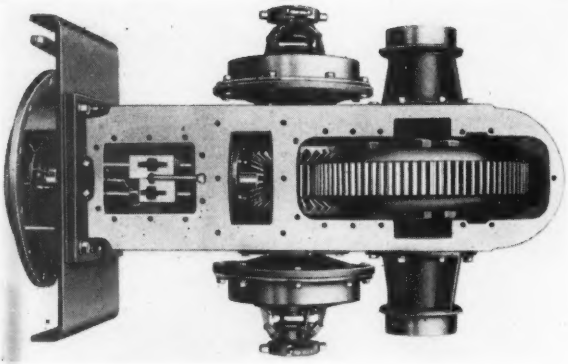

Fig. 2—View of gear mechanism of a road roller transmission.

ance is desired. Case hardening involves quenching in water, therefore if the design is intricate or otherwise subject to distortion, an oil quenching alloy carburizing steel should be considered. A.I.S.I. B-1112 and C-1117 are free machining, high sulphur low carbon steels suitable for screw machine and other parts where ease in machining is of prime importance. There are innumerable parts not requiring exceptional strength such as certain type studs, gears, shafts, and pins which can be made from steels in the plain, low carbon category.

Low carbon alloys (A.I.S.I. A-2315, A-4615, A-8620, and so on) are generally used on parts that are case hardened to provide for long wear combined with toughness and extreme shock resistance. As pointed out above they are also used in place of the plain carbon grades when control of distortion is a

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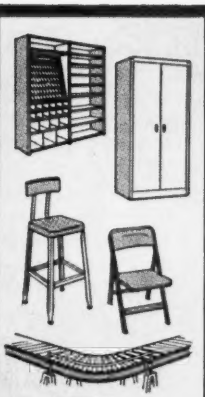

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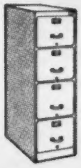

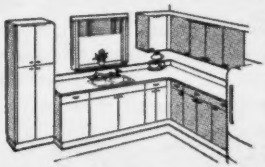

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factor. The price of the alloy steels is higher than that of the plain carbons and usually the higher the alloy content the higher the price, but at the same time they develop higher physical properties.

Figure 2 shows the interior gear mechanism of a road roller transmission in which the gears are made from AISI A-2315 and A-2512 so that they will be able to stand the high stresses and hard wear required in service.

The depth of case to be applied and the method of application depend, of course, upon the intended use of the part and the available treating equipment. Case depth may vary from under .020 in. to over .060 inch. If a case is required to withstand heavy pressure in service then obviously a deeper case is necessary to resist the crushing action than would be needed if such a force were much less. Distortion and the amount of grinding necessary to clean up the part after treatment is another point that should not be overlooked. It is possible to selectively case harden a workpiece by applying copper plating to all surfaces except the surface to be carburized and hardened; the only part of the piece or pieces that will be hardened during heat treating will be the unplated portions. Another method is to finish machine the surfaces to be hardened and leave the rest of the part oversize; then after carburizing and before quenching finish machine the oversize portions to remove the carburized material. In the subsequent quenching step finish-machined portions will harden.

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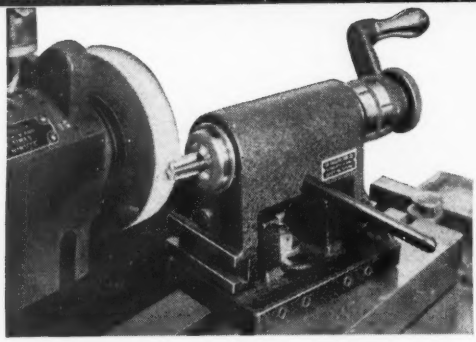

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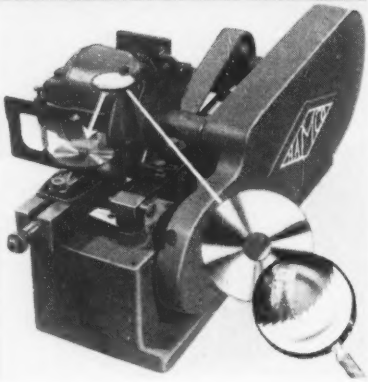

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of applying a case to low carbon steels are (1) Packing, (2) Gas Carburizing and (3) Liquid Carburizing and Cyaniding. The first two methods may be used to produce cases up to about .070 in. deep while the third method is generally used to produce the thinner cases which may be somewhat more brittle. However, much progress has been made in recent years in the manufacture of liquid salt baths that are designed to produce deeper and tougher cases than were possible to develop heretofore.

Parts requiring a combination of hardness and toughness are generally made from **medium carbon steels** which range in carbon from .35 per cent to .55 per cent. As in the low carbon group these steels may be divided into the plain carbon (including the free machining grade) and alloy types. They respond to the usual heating and quenching treatments with the carbon content determining to a large extent the hardenability of the plain carbon grades and the combination of carbon and alloy content the response of the alloy grades. One important point to keep in mind regarding the strength of these steels in the heat treated condition is that as the tensile strength, yield point and hardness increase, the toughness as represented by the elongation and reduction of area and impact values decrease.

The **plain carbon and free machining types** (A.I.S.I. C-1045, C-1137, and so on) are used where somewhat greater strength is needed than can be obtained with the plain low carbon grades. Where service stresses are not severe they are frequently used in the untreated, annealed or normalized condition. If more strength is needed they may be heat treated. Most of them are of the water quenching variety although some respond fairly well to oil quenching particularly in the smaller sections. The free machining types (C-1137, and so on) cost a little more than the C-1040, but their good ma-

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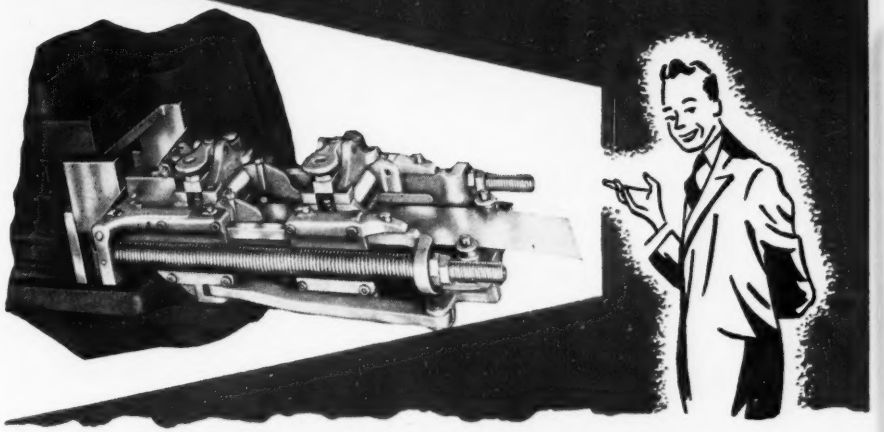

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TABLE IV

AISI	Condition	Tensile Strength	Yield Point	Red. of Area	Elong. in 2"	Mchbly.
C-1137	As Rolled	92,000#	55,000#	62%	27%	75%
A-4140	Annealed	90,000#	53,000#	62%	30%	55%

chining qualities especially on deep drilling and deep slotting jobs make them popular. They are generally machined in the untreated condition. C-1045 is usually annealed before machining.

Other applications for steels in this group are on large shafts in which their very mass insures adequate physical properties. Also, these steels in the "as rolled" or "normalized" condition can generally be used in place of annealed medium carbon alloy steel. Their price is less and the physical properties similar to the annealed alloy. (See Table IV above.)

Steels in this group can be flame or induction hardened. These treatments produce a hard wearing surface combined with a strong core—a condition which is usually better than can be obtained by carburizing a low carbon steel. Another advantage of this procedure is that there is very little distortion compared to that encountered in carburizing. The effectiveness of these surface treatments depends upon the steel used and the mechanics of the treatment. The surface hardness may vary anywhere from 50 to 65 Rockwell "C".

The **medium carbon alloys** (AISU A-4140, A-3140, A-6145, and so on) are used for heavy duty bolts, gears,

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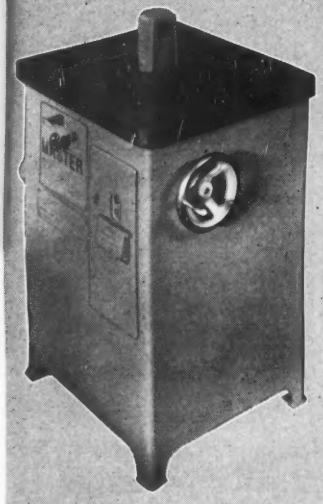

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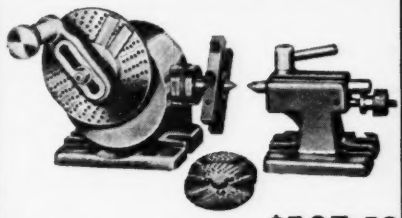

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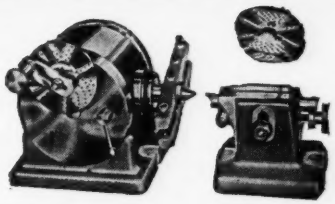

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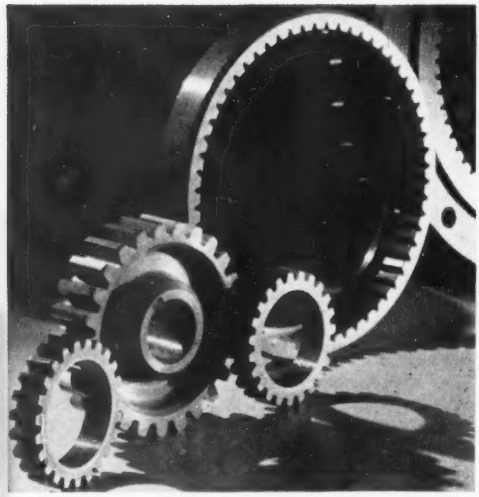

Fig. 3—The gears shown here were machined before hardening and then heat treated in an electric furnace using a protective atmosphere to prevent scaling and decarburization.

shafts, axles, and so on, and should be heat treated either before or after machining to take advantage of the alloying elements. Usually, the higher the alloy content the more costly the steel. Since these steels are of the oil hardening variety they distort less than the water hardening plain carbon grades. The gears shown in Figure 3 could be made from steels in this group very nicely. Those illustrated were machined before hardening and then heat treated in an electric furnace using a protective atmosphere to prevent scaling and decarburization. If the part is not too large (not over about 2½ in. to 3 in. cross section) and is of intricate design it can be treated by a suitable inter-

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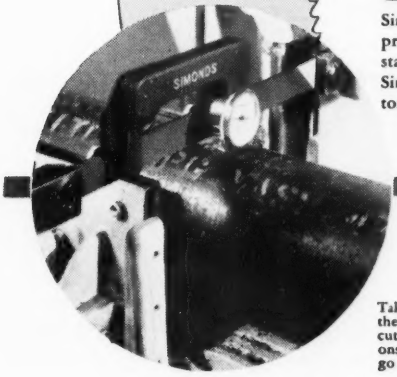

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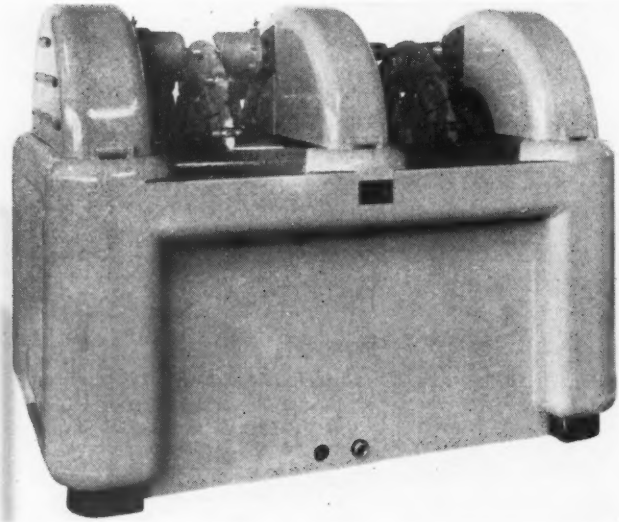

Fig. 4 — Automatic flame hardening machine designed for the selective hardening of both ends of ball peen hammers.

rupted Quench treatment (Martempering, Austempering or Isothermal) which will usually reduce the tendency to distort over the usual oil quench method and cut down on the subsequent grinding operation. Your local heat treater, steel representative or metallurgist can advise you on this point relative to a specific part.

The finished products of steels of this type are usually under 50 Rockwell "C" in hardness. Many parts, particularly those where toughness is the prime factor combined with a certain amount of wear, are used at a much lower hardness, for instance, 235 to 300 Brinel (22 to 32 Rockwell "C"), and are frequently machined from preheat bar stock or forgings and used without further treatment. The advantages of this are apparent to the machinist. It means often only one setup and the reduction or the elimination of expensive grinding operations. The machinability of the various alloy steels varies in the heat treated condition and this could be an important factor in the selection of the proper steel. There are some trade name steels on the market that machine considerably better in the treated condition than the standard alloy steels with otherwise similar physical properties and at similar price.

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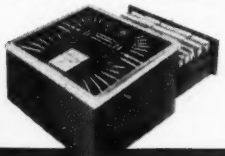

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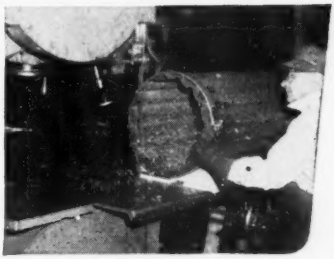

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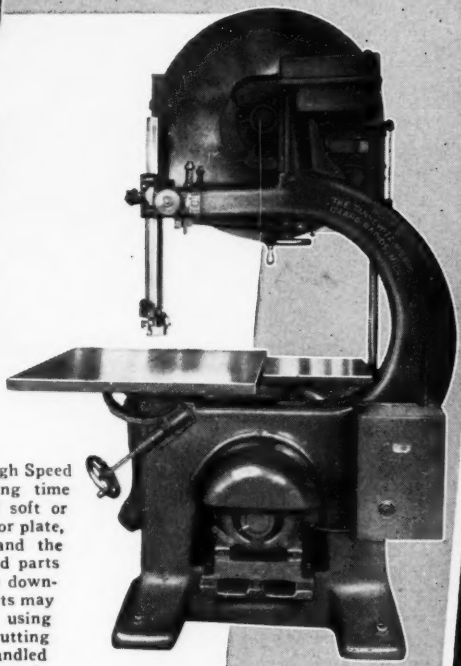

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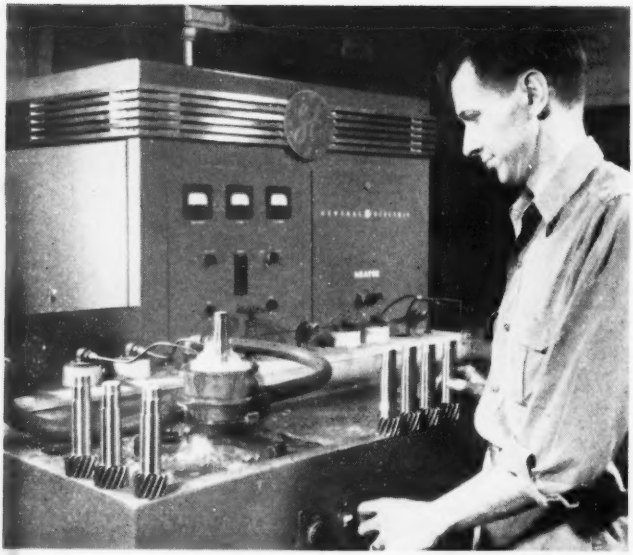

Fig. 5 — Illustration showing pinions being quenched after induction heating.

iated with a medium carbon alloy steel is indicated then steels in this category (particularly those in the .35 per cent to .45 per cent carbon range) can be flame or induction hardened. This might include gears, shafts and bushings. One of the outstanding advantages of this method of treatment is that it can be applied to those portions requiring wear resistance without materially affecting the rest of the piece. This selective hardening is illustrated in Figure 4 in which both ends of ball peen hammers are being flame hardened and tempered. Figure 5 shows some pinions being quenched after being induction heated. This results in the teeth being wear resistant while the balance of the pinion remains tough.

Another method of surface hardening is Nitriding which produces a very hard, abrasion resisting surface. The case is relatively thin and on the brittle side, but because of its high hardness (up to 70 Rockwell "C") it is commonly used on parts which are primarily subject to a great amount of abrasive wear. The Nitralloy steels are most frequently given this treatment, but many of the other standard and trade name medium carbon alloys respond quite well. Because of the mechanics of the nitriding process very little distortion occurs in the part being treated especially if it has been

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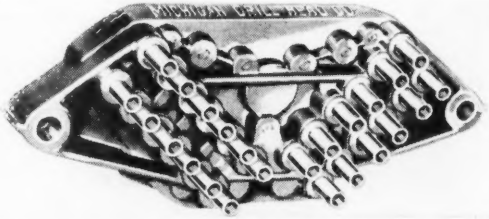

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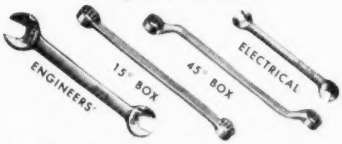

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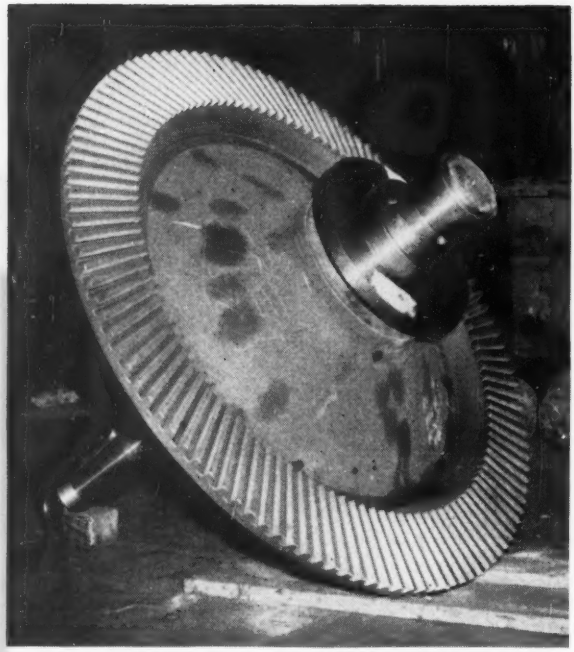

Fig. 6—Illustration showing gear of the type used in coal pulverizers.

stress relieved after machining.

The "Rich" alloys in the medium carbon group (AISI A-4340, A-2345, A-3250, etc.) respond very well to heat treatment especially in large sections. Their physical properties in the higher hardness bracket (over 321 Brinell) are better than those of the other medium carbon alloys and their resistance to shock is outstanding. The shaft and gear shown in Figure 6 are good examples of parts in which steel of this type can be used to good advantage. The assembly shown is used in coal puverizers in which very high physical properties are required and, because of the size, steels that respond well to heat treatment in large sections are used. In the lower hardness range and in smaller sections (under 3 inch diameter) their impact strength is still somewhat better than the other medium carbon alloys, but the other physical properties are about the same at the same hardness.

While these "Rich" alloys respond to heat treatment well in large sections—better than the leaner alloys and plain carbon steels—there is a limit to what even they can do. In such cases a normalizing treatment is about as satisfactory as a quench and draw and less expensive. In some jobs in

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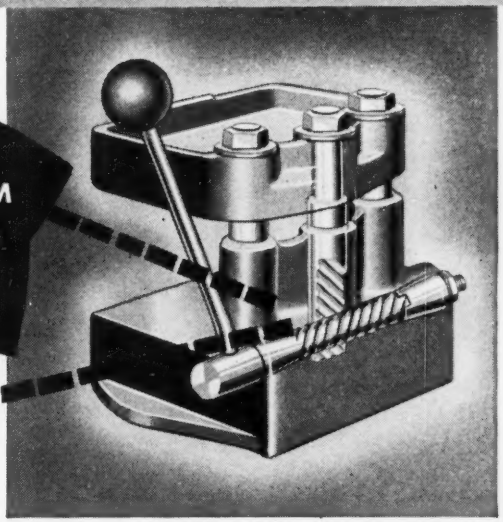

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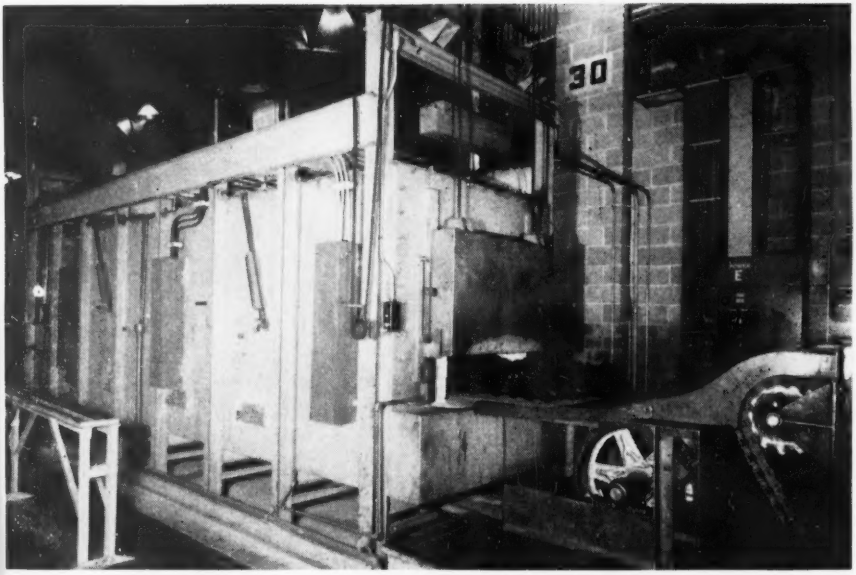

Fig. 7—View showing gears on conveyor at entrance end of electric drawing furnace.

which a large shaft is subject to excessive torque, frequently a hole can be bored through the center without affecting seriously the operation of the shaft. Since torsional stress works mainly on the outer portions of the shaft leaving the center comparatively free from stress, boring a hole results, not only in making the piece lighter, but also enables it to be more effectively heat treated and subsequently raises the physical properties including torque resistance.

The heat treatment of these "through hardening" steels brings to mind a fact the steel user should keep in mind when selecting a steel and that is the tables on the physical properties of steels in many books are based on small test piece sections of heat treated bars. Allowance should always be made for the effect of mass on heavier sections.

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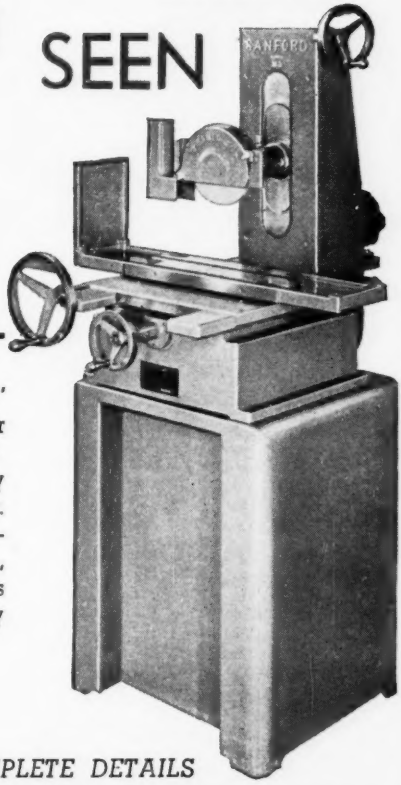

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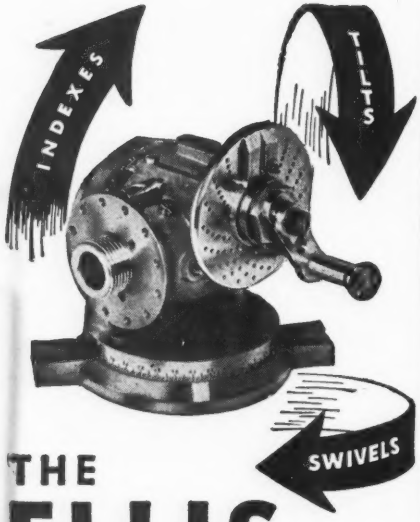

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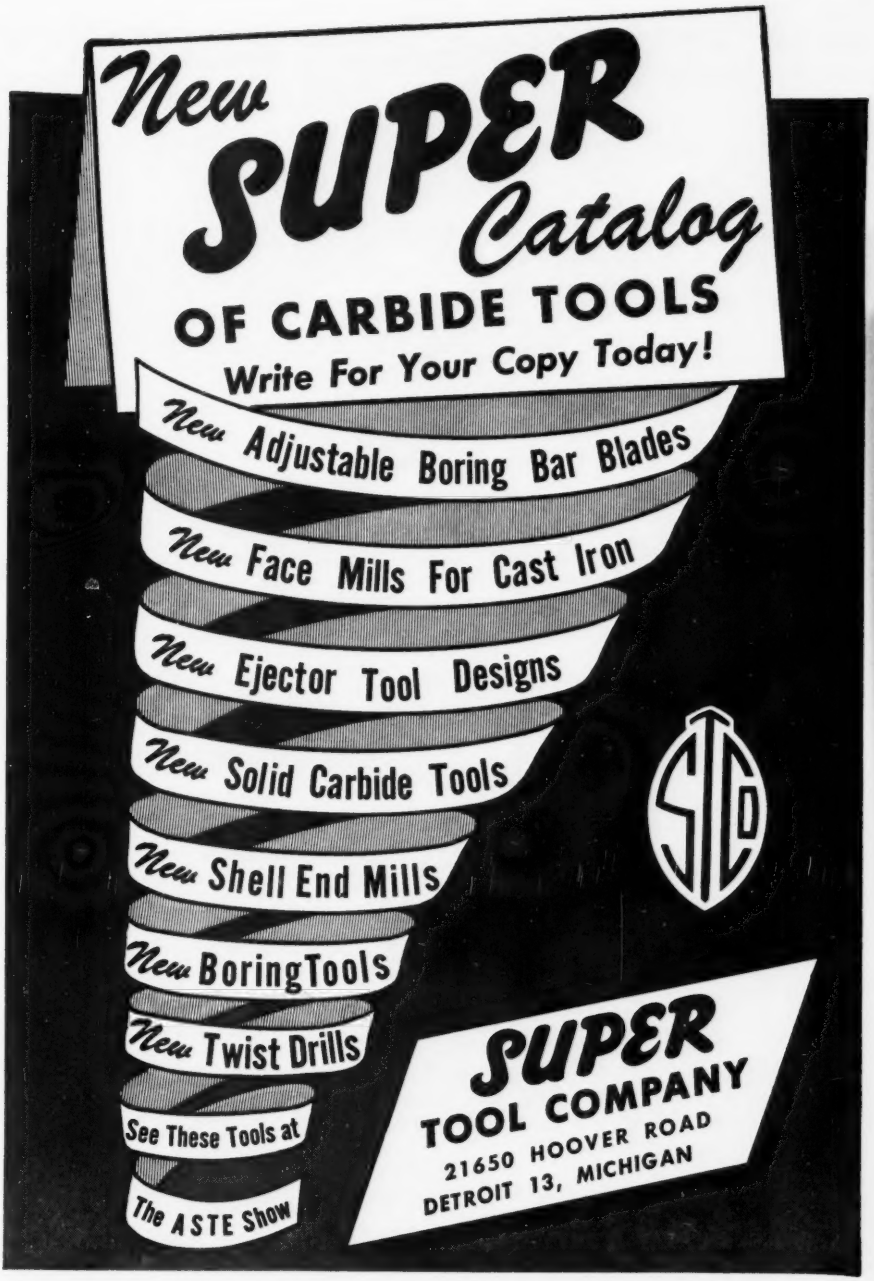
treating, but there is one point that is so frequently overlooked by the man in the shop, particularly if he does heat treating only occasionally, that a word of caution bears repeating. In the treatment of most steels, especially in large sections and those parts with both heavy and thin sections, they should not be taken from the quench and put into a tempering (drawing) furnace that is already up to the tempering heat if cracking or excessive distortion is to be guarded against. The furnace or other drawing medium should be brought up to the proper heat with the steel so that further strains are not introduced on top of those already induced by quenching. Figure 7 shows some heavy gears starting through a conveyor type electric drawing furnace in which the pieces will gradually reach the desired heat as they progress through the furnace.

Stress Relieving is another treatment that can save a great deal of processing time in the machine shop. The relief of machine straightening strains and other residual stresses will enable the machinist to machine comparatively long pieces with much less distortion than would otherwise be experienced. This might mean the difference between ordering a plain carbon steel and a more expensive alloy grade.

Another factor that might affect the selection between a cheap or an expensive steel is the finish after machining a part notably in corners and fillets. Heat treating failures frequently occur at corners where stress concentration is high and for this reason generous fillets should be in evidence wherever needed if the design permits. The fillets should also be free of tool marks.

The **high carbon water and oil hardening steels** usually range from .65 per cent to 1.30 per cent in carbon content and the trade name varieties dominate the field. They are usually higher in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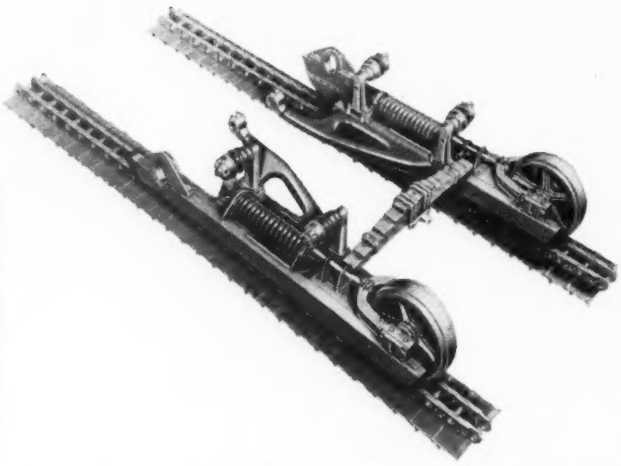

Fig. 8 — The coil springs shown in this tractor section are made from a Type 8660 steel.

price than other types. Machine work is generally done on them after they have been softened by annealing.

The water hardening grades (includes AISI C-1065 to C-1095) are used on parts such as chisels, heading dies, springs, centers, ratchets and others requiring high hardness (usually over 60 Rockwell "C") and of design suitable to be handled with the water quench in treatment. Many of the fine grained types are "shallow hardening" producing a hard case to a depth of ⅜ inch (depending upon the steel and treatment) backed by a less-hard tough core which resists cracking on a variety of shock applications such as header dies.

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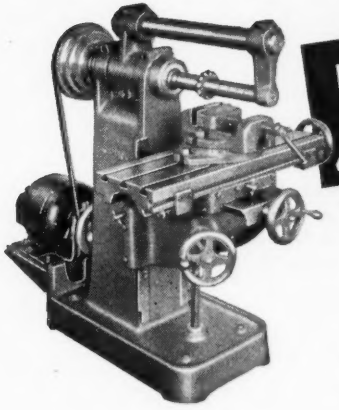

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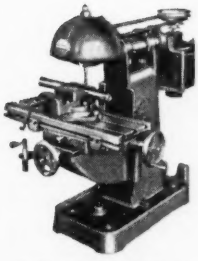
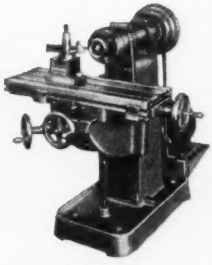


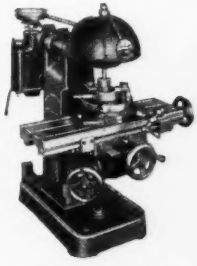
2 WANT A VERTICAL MILLER?

The same machine is quickly converted by substituting this special head. Again Timken Tapered Roller Bearings give smooth, chatter-free performance over a wide speed range. Accessories available: Full line of Benchmaster collets and drawbar; swivel-base vise.



3 WHEN IS A MILL NOT A MILL?

Here's a handy kink to obtain extra *lathe* facilities for facing, turning, forming, etc. Benchmaster Accessories required: Tapered Adapter and Tool Block. By lowering knee position and raising tool you can swing up to 23". Exceptional capacity!



4 QUICK CHANGE ARTIST

Here's the Benchmaster converted to a grinder! Free-rolling bearings maintain high spindle speeds without overheating or risking bearing injury. Grinds internally, surfaces, sharpens cutters, etc. Note Benchmaster 6" Rotary Table—a fine accessory.

5 AND NOW IT'S A DRILL PRESS

The No. 2 Morse Taper in spindle accepts standard Jacobs Chuck Shank. Raising table feeds work into drill. With this setup, drilling layouts is easy—simply measure off correct hole spacing with the lead screws.

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NOTE: BENCHMASTERS are also available with rack and pinion feed. For production work this provides exceptionally fast operation.

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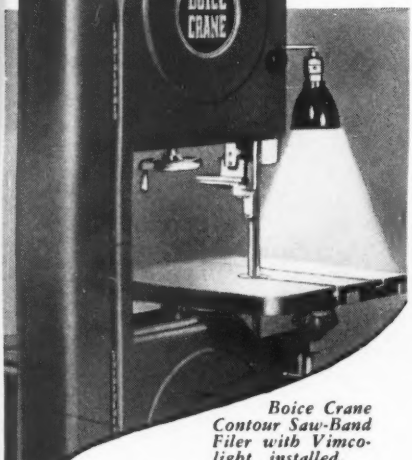
WHEN YOU INSTALL

VIMCO Lights



Boice Crane Contour Saw-Band Filer with Vimco-light installed.

Don't rely on your customers' general plant lighting alone! Install on-the-spot Vimcolights so that your machines perform at their highest rating no matter what the lighting conditions. Vimcolights give increased production, better workmanship, greater safety, less eyestrain. So much in customer satisfaction . . . for so little in cost.

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Easy to Mount
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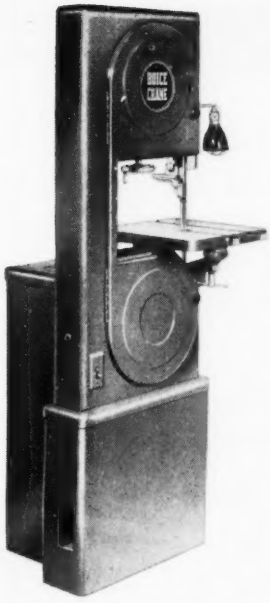
The oil hardening grades in this group are usually used on parts requiring a "through" hardness of about 55 to 62 Rockwell "C". Being oil hardening they can be used on more critically designed parts than the water hardening types because there is less chance of distortion. They vary in toughness with the various grades on the market and it is best to follow the recommendations of the different steel companies if results of past experience on the job are not at hand. Tools, dies, fixtures, cams, collets, arbors and bushings are included in the many applications for these steels.

Fig. 9—The valve shown here is made of Type 316 stainless steel.

It might be well to point out that there is no definite line of demarcation between the various groups of steels discussed in this article and often the line between the choice of a water or oil hardening steel can be just as indefinite. For example springs may be made from both water and oil hardening grades. The coil spings shown in the tractor section in Figure 8 are made from an 8660 type nickel-chromium-molybdenum oil hardening grade.



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The New Boice-Crane Low Cost Combination Contour Saw & Band Filer

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special wrenches
wrench templates
cams
spiral parts
irregular shaped stacked parts
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required by hand and *one-fourth* the time required by reciprocating filing machine. Eliminates guesswork in angle filing.

Rigid, solid welded steel frame. 15″ x 15″ ribbed cast work table mounted on two heavy cast trunnions.
New guide design sharply reduces blade costs.

Handles blades $\frac{3}{16}$″ to $\frac{3}{4}$″. File bands come in $\frac{1}{4}$″ and $\frac{3}{8}$″ widths, two shapes, six cuts. Patented self-aligning ends of file segments automatically lock to produce a continuous, rigid, flat surface.

EXCLUSIVE!

8 speeds, from 92 to 4100 blade f.p.m.
chart, mounted on machine, shows correct speed for accurate inside, outside and contour sawing of wood, sponge rubber, hard rubber, plastics, bakelite, masonite, asbestos, synthetic glass, transite, bronze, cast iron, bar and sheet steel, tool steel, brass, steel and aluminum tubing; and for filing metals and other industrial materials.

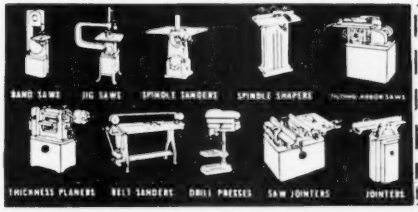

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TABLE V—STEEL APPLICATION GUIDE

Job Requirements	Low Carbon		Medium Carbon			High Carbon	
	C1020 B1112 etc.	A2315 A4615 A8620 etc.	C1045 C1137 etc.	A3140 A4140 A6145 etc.	A2345 A3250 A4340 etc.	Oil, Water, & Air Hard.	Stainless
Low strength	N						
Low strength & wear resist.	CH		SH				
Tough and Wear resist.		CH		SH	SH	H	
Combination toughness & wear resist. (Medium Duty)			N-A-HT				
Combination toughness & wear resist. (Heavy Duty)				HT			
Combination toughness & wear resist. (Very Heavy Duty)					HT		
Combination high tensile strength & wear resist.						H	
Corrosion & heat resist.							X

Symbols:—N—Natural, as rolled;
A—Annealed;
X—Indicates use;
H—Hardened;
CH—Case Hardened
SH—Surface Hardened
HT—Heat Treated (semi hard)

This chart is to be used as guide to selection only. It presents basic information only which can be modified and changed to suit individual requirements.

High carbon, high chromium and **air hardening** steels round out the high carbon group. The principal feature of the high carbon, high chrome grades is their resistance to wear. At the same time they are usually not as tough as some of the oil and air hardening analyses. The air hardening steels outstanding characteristic is their ability to harden with an air quench resulting in very low distortion. These are both expensive steels which are used on many of the parts listed under the oil hardening grades where their outstanding features can be used to advantage.

The **stainless steels** are used a lot for heat resisting parts, corrosion resistant pump shafts, valves, and so on. The valve shown in Figure 9 is made of Type 316 stainless for the control of highly corrosive fluids at all temperatures and pressures. There are several kinds of stainless steels including those which are hardenable by heat treatment and magnetic, those that are more resistant to corrosion, not hardenable by heat treatment and

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The all-steel stand is arc-welded to furnish the rigidity of a one-piece unit. Special leveling screws enable the user to level the plate quickly and to lock it securely.

Standard plate thickness is 6". Thickness of 8", as well as special sizes, grooving, scoring, machining and slotting may be had to order. On special order, plates may be keyed so that two or more may be assembled into one complete unit.

For specifications, plus information on other Challenge equipment for the tool and machine industries, write today. 632

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Better get a copy of their catalog and look it over for ways and means to cut our marking costs.
Write to:

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are magnetic, and those that are hardened by cold working rather than by heat treatment. The machinability varies with the various analyses, but they are generally more expensive to process than the lower-priced steels.

Table V is an application guide reduced to a very simple form.

It is impossible to set down definite rules saying just what steel should be used for a given part in every case because of the numerous factors that often have to be taken into consideration. A great deal of common sense is required and as stated in the beginning it is hope that this article will help in making the task of selecting the best steel for the job an easier one.

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.

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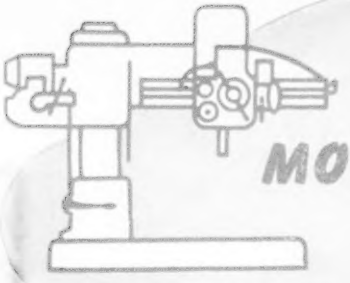


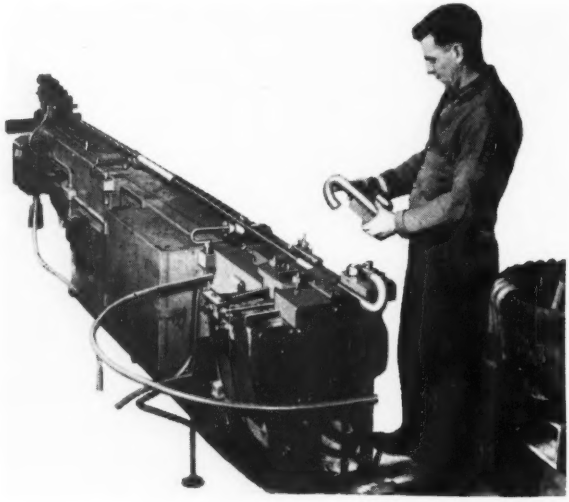
MODERN EQUIPMENT AT WORK

Production Rate for Bending Operation Increased 2½ Times

MANY tube and bar bending jobs, which were previously performed by a plumbing fixture manufacturer with hand-operated or old-fashioned equipment, are currently being handled on production bending machines at speeds which result in substantial savings in costs. A typical example of a bending job is illustrated herewith.

On this job, drain traps for sinks are formed automatically with two 180 degree bends on a Pines size ¾ production bending machine. The tubing to be bent is brass, has a diameter of 1½ inches, and a wall thickness of 0.032 inch. The stock is pre-cut to a developed length suitable for two finished bends. The operator simply loads a piece of tubing into the machine and then touches a push button to set the machine in motion for the first bending operation. After the first bend, the piece is turned, and the second bend is completed in a similar manner.

Since the installation of the production bending machine, which is electrically controlled and hydraulically operated, the production rate has been increased 2½ times. Now, 400 to 500 bends per hour can be made, whereas, previously, with the old equipment, the produc-



Pines production bending machine used for bending drain traps for sinks.

tion rate was less than 175 bends per hour.

In addition to the increased production, the improved tool design for the bending of sink trap tubing, particularly the improvement in flexible mandrel design, has resulted in greater accuracy, improved quality, and reduced maintenance costs. Nested ball segments are used to prevent excessive breakage of balls and links, thus reducing the number of production interruptions considerably.

Fabricators in particular may be interested in the fact that this bending equipment is readily adaptable not only to round tubing and bars, but also to rectangular and square stock, and rolled or extruded sections. The machine may be changed over quickly to accommodate a wide variety of work including serpentine, stacked coil, compound, and multiple bends. A heavy cast steel nose, alloy steel spindle, adjustable gibs, and Timken bearings are used in order to assure long operating accuracy with a minimum amount of maintenance expense. The equipment is manufactured by Pines Engineering Co., Inc., Aurora, Illinois.

Tiny Fuel Tank Leaks Discovered with Electronic Leak Detector

AN electronic leak detector, which is so sensitive that, with it, leaks small enough to release only one ounce of gas in a century may be detected, is now being used to check welds on all fuel and traction tanks produced by the Lintern Corporation of Berea, Ohio. The completely welded fuel tanks, whose capacity sizes range from 85 to 150 gallons, are made to be used in large transportation trucks. In order to make certain that there are no possible spots which would permit gasoline seepage, all welds are checked before the finished tanks are passed from the assembly line.

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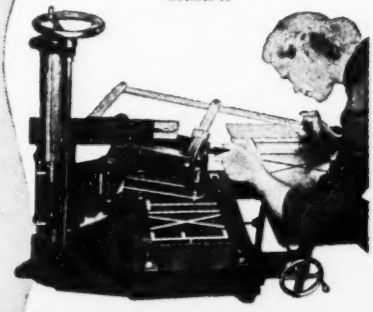

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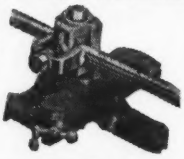

COMPLETE SETS
(With three bars)

Set No.	Diameter Bar Inches	Tool Bit Inches Square	For Lathe Swing Approx.	Price Complete
0-AA	*3/8, 1/2, 3/4	*, 5/32, 1/4	8" to 12"	$ 16.40
1-A	1/2, 3/4, 1 1/8	5/32, 1/4, 3/8	12" to 16"	26.35
2-A	5/32, 1/2, 1 5/32	5/32, 5/32, 3/8	16" to 18"	35.15
3-A	3/4, 1 1/8, 1 1/2	1/4, 3/8, 1/2	20" to 22"	61.55
4-A	1/2, 1 5/32, 1 7/8	5/32, 3/8, 5/8	24" to 36"	87.95
6-A	1 1/2, 1 7/8, 2 1/2	1/2, 5/8, 3/4	24" to 36"	193.50

* 3/8" diameter bar included in set is solid tool steel.

GLOBE BORING BARS
(Calibrated)

Bar No.	Dia.	Length	Tool Bit	Price
162A	3/8"	7"	1/8	$3.50
122A	1/2"	8"	5/32	3.50
123A	5/8"	9"	5/32	3.50
124A	5/8"	10"	5/32	3.50
125A	3/4"	11"	1/4	4.35
126A	1 1/8"	13"	5/32	6.30
127A	1"	14"	5/32	6.30
128A	1 1/8"	16"	3/8	8.75
129A	1 5/8"	18"	3/8	12.30
130A	1 1/2"	23"	1/2	16.30
176A	1 7/8"	30"	5/8	36.35
155A	2 1/4"	36"	3/4	72.70

Permanently graduated in 1/4" calibrations indicating depth of bore. Eliminates necessity for file and chalk marks.

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HIGH SPEED CUTTER BITS

1/8x1 1/2	1/8x2 1/2	5/32x1 1/2	5/32x1 1/4	5/32x2 1/2	1/4x1 1/4	1/4x2 1/2
.20	.30	.20	.25	.30	.25	.35

5/32x1 1/4	5/32x2 1/2	3/8x1 1/2	1 1/2x2	5/8x2 1/4	5/8x4 1/2	3/4x2 1/2
.30	.45	.40	.85	1.25	2.25	2.15

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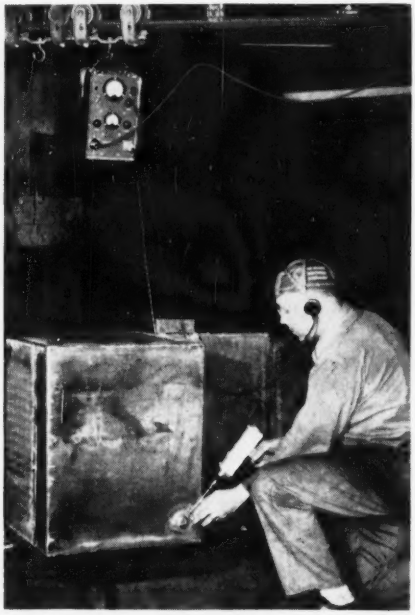
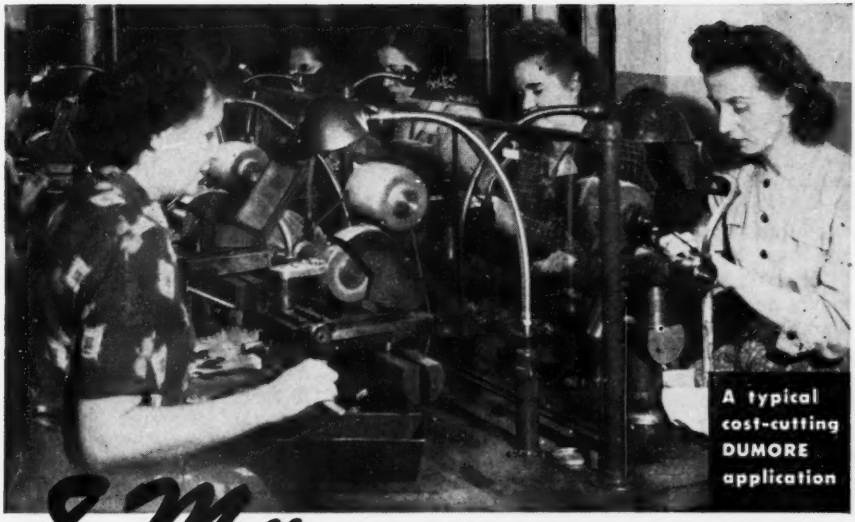
According to Lintern engineers, 18 tanks may be turned out in an average day by six welders and one inspector, the latter being provided with a G-E leak detector. The top plates of the tanks are made of mild steel deck plate; the bottoms and ends are made of 12 gage sheet steel. Fabrication takes place in six stages. The tanks are placed on iron rails so that they



An inspector is shown using a G-E electronic leak detector to check the welded seams in a fuel tank.

may be pushed from one welding booth to another as they are moved along the assembly line. First, the inner baffles and braces and the bottom sections are tacked together; next, the side panels are tacked on; and then final weldments are made after all of the parts are assembled. Approximately 60 feet of electrode are used for each tank.



8 Million grinds per year on 450 different set-ups ...cost less than ½¢ *per grind*

Volume production of precision parts at lowest cost is a *must* at Felt & Tarrant Mfg. Co., makers of the Comptometer. Use of Dumore Grinders for production has been a logical development, checked every step of the way by both the production and cost departments.

Permanent set-ups cut labor cost

Noting Dumore performance on tool room and maintenance jobs, Production tried them on the line, found them ideal from cost, accuracy and output standpoint. At present, they are using twenty-one Series 44's and nine older models. The set-ups average $25 apiece, are simple and permanent, permit use of unskilled labor. Total investment for the 450 individual set-ups is only $3,300 for Dumore Grinders and $11,000 for special mounting fixtures. Model changes, requiring new parts, are simply taken care of by building additional low-cost fixtures.

Dumore costs 1½c per hour to own

On a typical operation, Dumore, plus fixture depreciation, power, maintenance and supplies cost Felt & Tarrant only 34¢ per hour. Part, requiring 5 grinds, costs only 2¢ per unit, including labor.

Why not examine your grinding operations with an eye to incorporating Dumore economies. Your Dumore Dealer will be glad to recommend installations, and, if you wish, arrange for free demonstration in your plant. Call him, or write: The DUMORE COMPANY, Dept. C-33 Racine, Wisconsin.

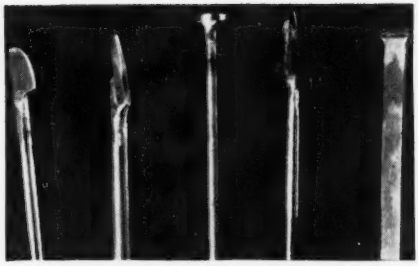
DUMORE

DG-2

At the end of the assembly line, all welded seams are checked by an inspector with the G-E electronic leak detector. As may be seen in the accompanying illustration, the instrument is a portable one; and it consists basically of an indicating unit and a pistol-shaped pick-up. An auditory signal is used to indicate leaks, and the inspector wears earphones in order to hear these signals. With the new instrument, even minute leaks may be detected, and these leaks may then be repaired before the units are shipped. Lintern engineers have stated that previous leak testing methods were unsatisfactory because, with them, only large leaks could be discovered.

Scrapers Improved by Using Cemented Carbide Tips

THE accompanying illustration shows an application of cemented carbides which has been found to be very useful by a midwest machine tool builder. Several scrapers which are tipped with carbide are shown in the illustration; these scrapers are used for the reconditioning and original finishing of machine tool slides, bearings, lathe ways, and other similar parts.

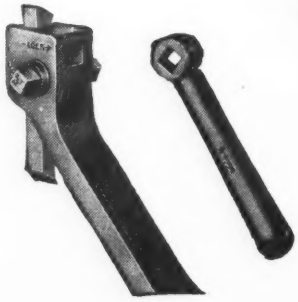


Five scrapers which were improvised by brazing standard Carboloy blanks to old files and then grinding the blanks to the desired shapes.

The scrapers are simple to make. Standard Carboloy cemented carbide

STOP...

TOOL CHATTER



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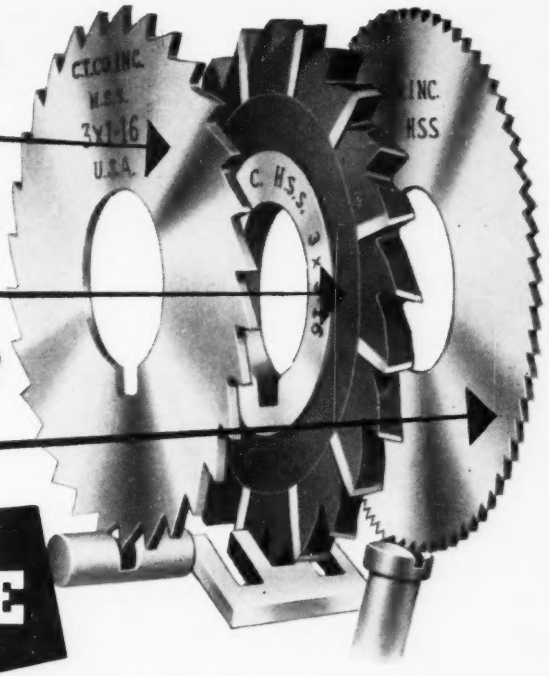

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blanks are brazed to old files—both round and flat—and then the blanks are ground by hand to the desired shapes. Carboloy grades 905 and 883 are used due to their extremely high abrasion resistance and good degree of toughness.

The improvised carbide scrapers have been found to last many times longer—on both round and flat work—than the scrapers which were used formerly. An appreciable amount of grinding time may be saved by using the carbide scrapers; and, in addition, clean, sharp edges, showing no tendency to scratch or gouge the surfaces as did the sharpened files used formerly, are maintained on the scrapers for longer periods of time. A four deg. negative rake, ground on the tips with a 220 grit diamond wheel, eliminates any tendency for the scrapers to jar or chatter.

Welding Booth Equipped with Cloth Panel Sides

SHOWN in the accompanying illustration is a corner of a new type of welding booth being used at the main plant of Tube Turns, Inc., Louisville, Kentucky, manufacturer of welding fittings and flanges. Panels of vinyl-coated cloth woven of Fiberglas yarns form the four sides of the booth.

The cloth, which is known as Fibrylon and which is manufacturer by The Holton Corp., of New Orleans, Louisiana, is suspended by means of hooks from a rod frame which is made the size of the work area. The cloth panels are overlapped, and they may be pushed aside quite easily in order to bring work into or take work from the work area. The panels are weighted at the bottoms in order to prevent flapping, and they are designed to clear the floor

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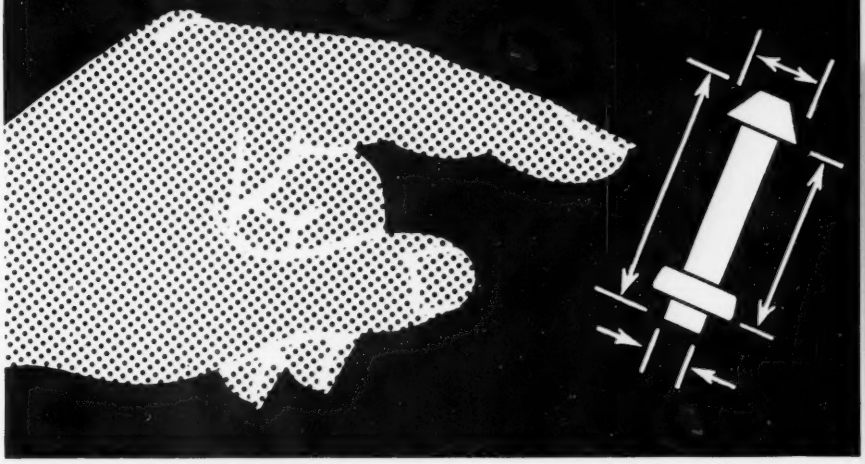

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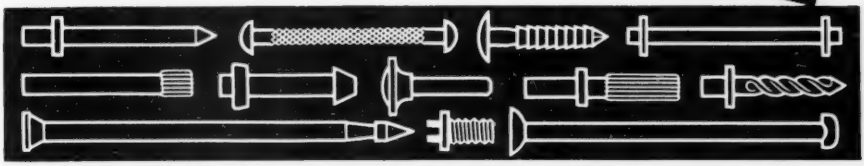

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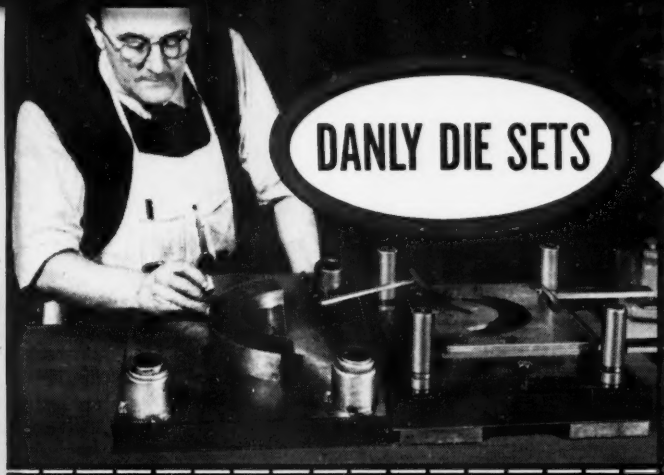

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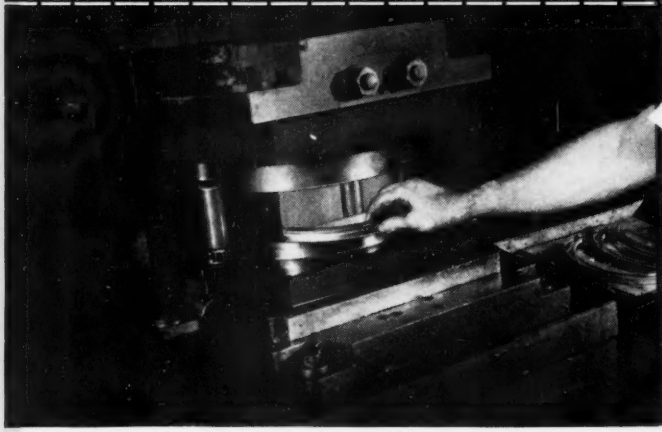

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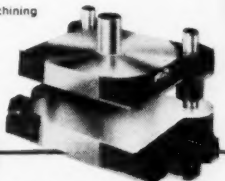

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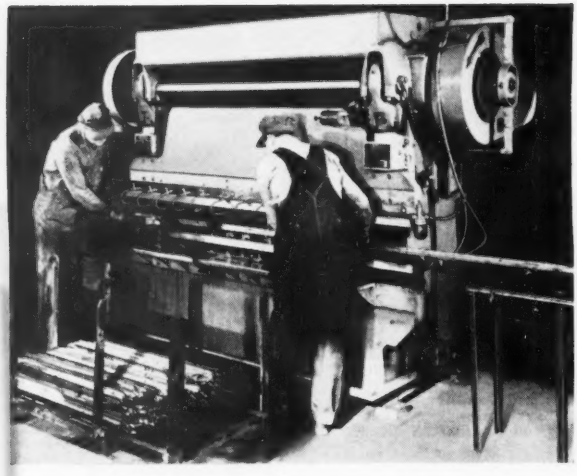

The punching tools of this gang punch press installed at Sunlight Metal Products Corporation are automatically lubricated at each stroke.

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With the lubricator in operation the foot trip contacts and opens a valve, releasing air automatically through the lubricator and to each punching tool and spring - type stripper so that the tool is automatically lubricated with an air-oil fog for every punch made. When a new setup of the gang of punches is required, the ⅛-inch copper tube leading from the nearest Norgren needle valve is bent to direct the air-oil fog directly upon each punching tool. After this adjustment, the lubrication system requires absolutely no attention beyond an occasional refill of the reservoir.

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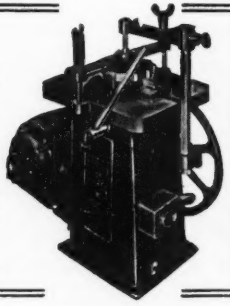

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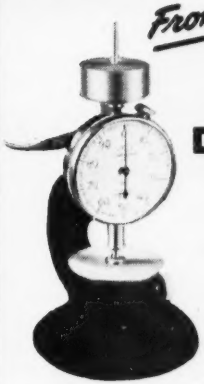

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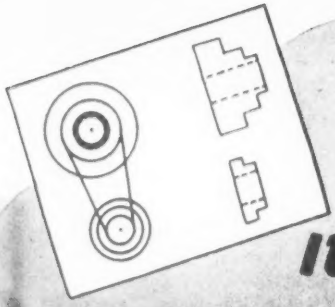


IDEAS FROM READERS

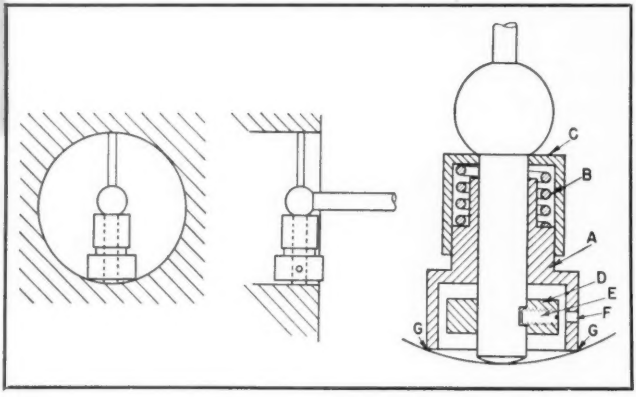
Centering Device for Telescopic Gages

By Charles Beresford

ALTHOUGH a very useful instrument for measuring bores, the standard design of telescopic gage, when used on bores exceeding 2 inches in diameter, tends to stick in the hole unless it is held in an absolutely diametrical position. The attachment illustrated in the accompanying sketch is designed to greatly increase the sensitivity of telescopic bore gages by locating the gage on an absolutely diametrical line in the hole being measured.

As shown in the enlarged sectional drawing, the attachment includes a bell-shaped sleeve, **A**, which has a close sliding fit on the fixed end of the telescopic gage and is forced downward under pressure of a spring, **B**, contained in a cylindrical cover, **C**. A stop collar, **D**, limits the downward movement of the sleeve and holds the centering device in place on the gage. The only modification necessary to the gage is the grinding of a small flat to accommodate the stop collar retaining screw **E**. A hole, **F**, in the lower skirt of the bell allows for entry of a screw driver or heagon socket wrench to that the stop collar screw can be tightened.

The cylindrical cover **C** not only acts as a stop for the upper end of the spring **B**, but its extended sides form a casing in which the spring is completely enclosed. Where appearance is not



Sketch of centering device for telescopic bore gages

important, the extended sides of the casing can be dispensed with, in which case a simple washer can be used to accommodate the pressure exerted by the upper end of the spring.

The bottom face of the sleeve **A** is arranged to contact the wall of a bore at two points, as indicated at **G**. Since these points are symmetrically located about the vertical center line of the gage and are at right angles to it, they will naturally maintain the gage center line in a truly diametrical position in the bore.

In use, the fixed end of the gage with centering device attached is inserted into the bore and pressed against the wall of the bore until the sleeve of the centering device and end of the gage provide a three-point contact. The opposite end of the gage can then be presented to the upper wall of the bore by means of a rocking motion, with the result that an accurate comparison of the gage setting and bore diameter is readily obtained.

In making a centering device of this type, it is important that the spring selected be of low strength, having only sufficient poundage to ensure that the lower portion of the bell is maintained in contact with the wall of the bore. A strong spring will cause a loss of sensitivity when using the gage. The entire attachment can be made of soft steel or light alloy since the rate of wear on the bottom edge of the bell will be even at both contact points; and, since the attachment is permitted to rotate freely on the fixed portion of the gage, new contact surfaces are continually presented.

Tinning of Aluminum

By W. E. WARNER

Essex, England

ALUMINUM is used widely at the present time for a number of electrical applications; and for many of these application, soldering is required.

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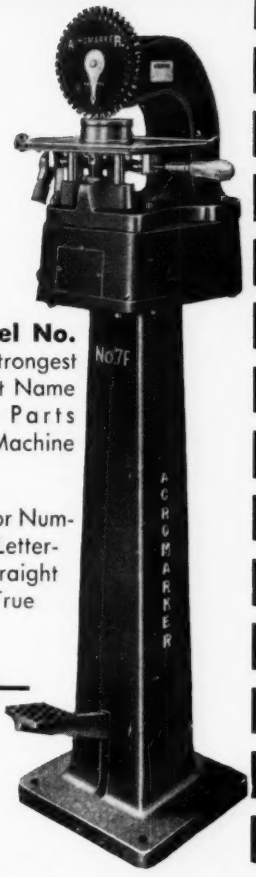

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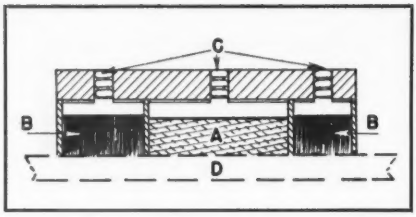

Schematic arrangement of a fixture used for tinning aluminum

The soldering of aluminum is rather difficult, due mainly to the rapid oxide formation on the metal surfaces which makes cleaning ineffective. It has been found that by tinning the aluminum surfaces lightly, the job of soldering may be made much easier.

In order to tin aluminum succesfully, it is necessary to first heat the aluminum to a temperature which is sufficiently high to melt the solder. The solder recommended for tinning has a composition of 90 per cent tin and 10 per cent zinc, no flux being required. After the aluminum is heated, the solder is allowed to run on the surface; and it is actually scrubbed into the surface. This operation serves to break up the oxide film and to tin the surface.

The tinning operation may be made easier if a fixture similar to the one shown in the accompanying illustration is used. The fixture consists of a rectangular fiber box, about four inches by two inches, which has three compartments and is open at the bottom. A block of solder, **A**, is positioned in the center compartment of the box; and in the compartments at either end are positioned wire brushes, **B**. The block and brushes are maintained in position under a slight pressure by means of three spring retainers, **C**.

In operation, after an aluminum workpiece, **D**, has been heated to a proper temperature, the fixture is pushed over the surface of the part.

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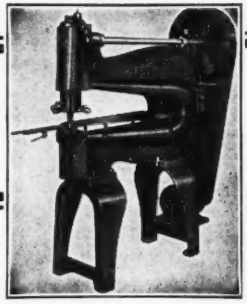

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The original oxide film is broken up by means of the brushing action of the first brush; a small amount of the solder, **A**, is melted upon contact with the surface; and the solder which is melted is spread uniformly by means of the brushing action of the second brush. In this way, a surface may be tinned easily; and, after tinning, the subsequent job of soldering may be accomplished quite readily.

An initial cleaning of the aluminum surfaces is required in order to remove any dirt or grease which may be present. Both the solder block and the brushes may be provided with slight curvatures if it is desired to tin curved aluminum surfaces .

A Handy Tool for Wire Bending

By B. A. Lee

A HANDY bending tool, such as the one sketched herewith, may be used quite satisfactory for bending large quantities of wire parts. The tool was devised for bending a large number of $\frac{3}{16}$-inch wire hooks similar to the one shown at detail **X**; the quantity was too large for straight hand work.

The tool consists basically of a modified pair of tongs and a steel block. The tongs are modified as follows: a special piece of steel, **A**, having a curved outer surface of the same radius as the inside radius required in the wire hook, is welded to one of the tong jaws; V-grooves are cut in the insides of both tong jaws and in **A**, as shown; and a small stop is "tacked", as shown, at the end of one of the grooves. As may be seen, a small hole is drilled through **A**, its center being the same as that of the curvature. Block **B** is a rectangular steel piece which may be held securely in a vise. Two pins, **C** and **D**, are positioned in this block. Pin **C**, which serves as a pivot for the tool is made from a piece

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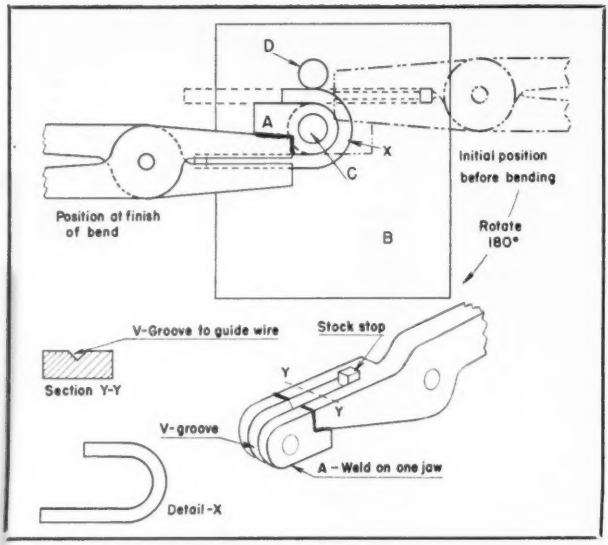


Sketch of an inexpensive tool used for bending small wire parts

mits the wire to be bent to the desired shape.

Several hundred hooks were made successfully with this bending tool, and it is believed that the tool may be adapted to a variety of different shapes to a variety of different shapes. If heavier wire is to be bent, it is suggested that the wire be heated prior to the bending operation.

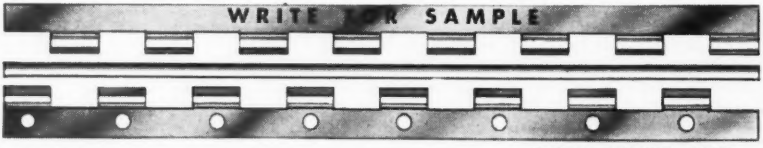
of drill rod, and it is slightly smaller in diameter than the hole in **A**. Pin **D** serves as a guide for the wire; it is located in line with **C** and at such a distance away from **C** that it bears against the outer surface of the wire.

In use, the wire for a hook is positioned in the tong grooves against the stop, and then the wire is clamped securely in place. The hole in **A** is then slipped over pin **C** so that the tongs are in the position shown at the right in the illustration. The tongs are rotated 180 deg., and this rotation per-

Ingenious Method for Milling Special Threads

By Edward Diskavich

THE half-round workpiece shown in Fig. 1 is a part which presented somewhat of a problem in machining due to the fact that it was necessary to cut special V-threads in the half-round surface. The part is one which is used as an insert in a plastic mold. A lathe could not be used for the threading operation because of the difficulties of mounting, therefore



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a special fixture was designed so that the parts could be threaded on a vertical milling machine. A disassembled view of the fixture is shown in Fig. 2, and a sketch of the fixture in position on the milling machine table may be seen in Fig. 3.

The main parts of the fixture consist of a special screw, **A**, and a special nut, **B**, on which threads are cut to the pitch required on the work and which serve as a template for the work. The screw has a diameter of approximately 3½ inches, and it is 3 inches long; the nut is approximately 4½ inches in diameter and 2 inches thick. Both the screw and nut are faced off square on their mounting surfaces, and mounting holes are drilled and tapped in both parts, as shown. Screw **A** is fastened to a foundation plate, **C**, and nut **B** is fastened to a top plate, **D**. The top and bottom surfaces of plates **C** and **D** are ground parallel to assure accuracy.

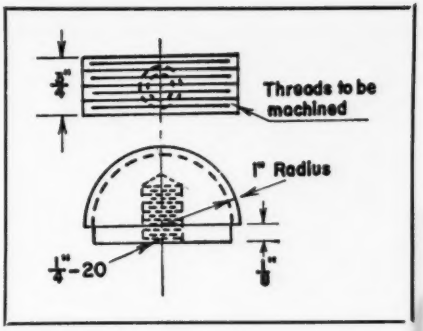

Fig. 1—Half-round workpiece on which special threads are cut

Located on plate **D** is a work-holding angle plate, **E**, which is provided with a tapped hole to match the tapped hole in the workpiece. A screw is used to hold the workpiece to the angle plate. Plate **E** is held in place by means of two slotted clamps, **F**, which, in turn, are fastened to plate

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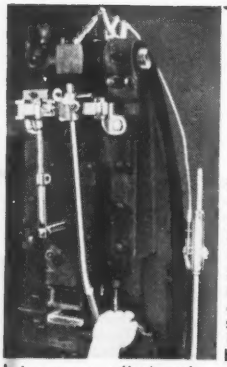

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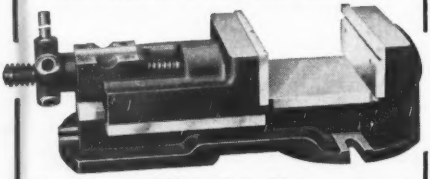

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D by means of screws which are passed through the clamp slots. Angle plate **E** is located on top plate **D** so that, when a workpiece is mounted on the angle plate, the center line of the workpiece will be in line with the centerline of the special screw and nut.

After a workpiece has been positioned, the entire unit is placed on the table of a vertical milling machine and fastened securely. The machine cutter (made especially for this job to cut V-threads) is set in relation to the work so that the first cut is taken at that point on the work which is calculated to be the proper beginning of the threads. This position is then recorded. In making the cut, the top plate, **D**, is turned, .005 inch at a time, after the tool is fed into the

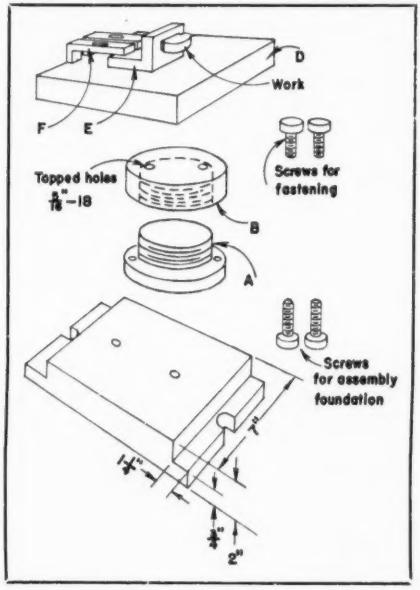


Fig. 2—Disassembled view of special fixture designed for cutting threads on workpiece shown in Fig. 1

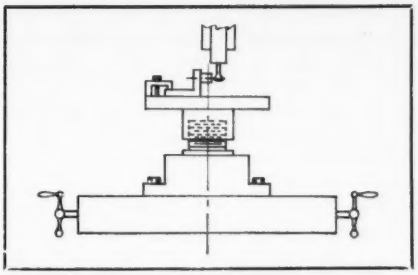


Fig. 3—Sketch showing special fixture, with a workpiece in place, mounted on the table of a vertical milling machine

work. The screw and nut arrangement permit the work to be cut to the proper pitch. After the first thread is cut in the half-round, the unit is returned to the "beginning" position, the machine table is raised a distance equal to a pitch of the thread, and the procedure described for cutting the first thread is repeated. The remaining threads are cut in a similar manner.

Dial Test Indicator Attachments

By Daniel E. McDonald

An attachment has been devised to facilitate vertical adjustment of a standard dial test indicator. An indicator with the attachment is shown in the accompanying illustration; the parts described are referred to by letters.

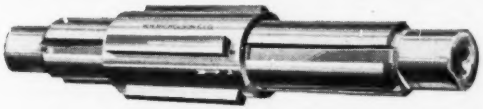
A clamping saddle, **B**, is clamped securely to the upright of the indicator by means of a saddle clamping screw, **C**. An adjusting screw, **D**, is inserted through a bushing in one end of saddle; and this screw threads into a drilled and tapped hole in the axle screw, **A**. A knurled head on the adjusting screw is shown in the illustration at **E**.

To adjust the indicator, the main clamping screw is loosened first. The vertical adjustment is then made by means of the adjusting screw; and, after the proper adjustment is made,

SET OF

14 Nicholson Mandrels

Takes Every Size Bore ½" to 7"

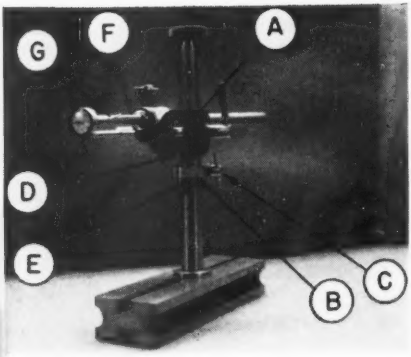


Actually 209 solid arbors would be required to fit all bores between ½" and 7", advancing by 1/32". But 14 Nicholson Expanding Mandrels will accommodate this entire range, and all in-between sizes as well. Hardened tool steel. Sold singly or in sets. The standard in shops the nation over.

BULLETIN 1043 shows how to save time, promote precision with these widely used tools.

W. H. NICHOLSON & CO., 136 Oregon St., Wilkes-Barre, Pa.

Steam & Air Traps . Control Valves . Expan. Mandrels . Arbor Presses . Welded Floats



Dial test indicator with adjusting attachments

the main clamping screw is locked in position. Thus a highly accurate adjustment may be obtained quite readily.

Several other alterations were made on the indicator. A new type of dial holding rod and bushing, **F**, were substituted for the original. The new rod is considerable longer, and the new bushing has a $\frac{1}{16}$ inch slit machined into its entire length to facilitate clamping. The length of the rod was increased so that the measurement of bores and other surfaces covering a great depth or area could be carried out more easily. An indicator clamping screw, **G**, was incorporated to locate the dial indicator in various positions. Finally, a new type of dial indicator was installed, a Federal size "A", $1\frac{1}{8}$ inch O.D. indicator reading in .001 inch. This was done for the purpose of getting into small bores and also to eliminate as much weight as possible on the end of the rod when it is extended.

Automobile Transmission Used in Driving Lathe

By Elton Sterrett

BY mounting a standard automobile transmission between the drive motor and the step pulley of a lathe, it is possible to obtain a series of gear changes for the lathe which may be selected through a shift lever in practically the same manner as the speed ratio is selected for an automobile. As may be seen in the accompanying illustration, the transmission is mounted on a stub shaft which is located parallel to and directly above the lathe a pair of brackets which extend out

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SPOT
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YOUR OWN
LEAD HAMMERS
Cook Molds and Ladles will produce lead hammers that can "take it" and save you money. Simple to operate.
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from the motor support post, and it is supported by ball bearings at both ends.

A gear shift lever, which extends downward to a convenient height over the lathe, is positioned through a slotted member at one end of the transmission bracket. The button for control of current to the motor is located in the free end of this shift lever so that the motor may be stopped and

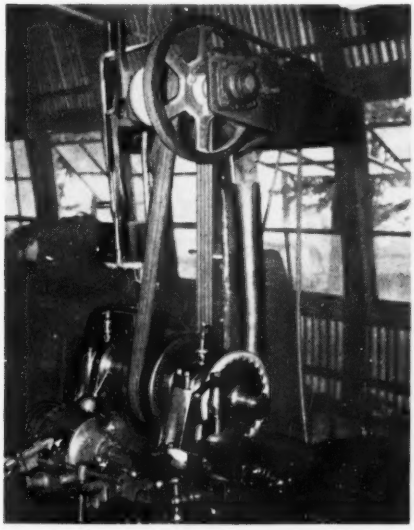


Illustration shows how an automobile transmission may be mounted to provide a series of gear changes for a lathe.

the gear ratio selected with a minimum amount of time lost. The final drive is obtained through a set of V-belts, a grooved belt pulley being used on the transmission and a flat belt type being used in conjunction with the lathe step pulley.

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.

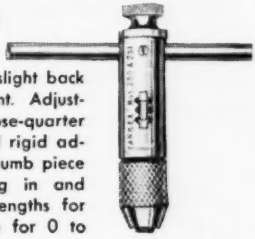
Jig in a Jiffy

"YANKEE"

ANGLE VISES

Shortcut costs on small jobs with this fast-acting, economical jig. Lock the work in the "Yankee" Angle Vise. Tilt for the angle and lock. You're set up for every operation . . . hand or machine. Also available with quick-release swivel base. Two jaw widths . . . 2" and 2¾". Each vise supplied with grooved "V" Block for holding rounds.

"Yankee" Ratchet Tap Wrenches for tight spots



Ratchet needs only slight back and forth movement. Adjustable cross-bar for close-quarter work. R.H., L.H. and rigid adjustments. Knurled thumb piece for speedy starting in and backing out. Two lengths for 0 to 5/16" taps, one for 0 to 3/16" taps.

WRITE FOR "YANKEE" TOOL BOOK

NORTH BROS. MFG. CO.

Philadelphia 33, Pa.

YANKEE TOOLS NOW PART OF STANLEY THE TOOL BOX OF THE WORLD

News of the Industry

Arthur J. Renz Named Field Engineer for Pope Machinery Corporation

The Pope Machinery Corp., 261 River St., Haverhill, Mass., has named Arthur J. Renz as field engineer on precision spindle applications. Mr. Renz is a mechanical engineering graduate of The Massachusetts Institute of Technology, as well as a graduate of the Lowell Institute School, the General Electric Apprentice Course, and the U. S. Navy's Electronic Technician's School. Prior to his association with Pope Machinery Corporation, he was with the tool and die department of General Electric Company.

Arthur J. Renz

Mr. Renz has been given intensive factory training in the design, assembly, testing and practical use of precision spindles in the Pope Machinery Corporation's plant.

Demambro New Lincoln Park Industries President

At a recent meeting in Detroit, the directors of Lincoln Park Industries, Inc., elected Gene Demambro president of the corporation, which includes, in addition to the Lincoln Park, Michigan plant, the Curtis Machine and Standard Portable Cord divisions at Jamestown, New York. Mr. Demambro, who has been vice president of the corporation and general manager of the Curtis Machine Division, began his industrial career with the Ford Motor Company, going through the Ford Trade School and becoming a foreman. He also studied law at night school, leaving the employ of the Ford Motor Company in 1933 to practice law.

Gene Demambro

In 1942 he entered the Navy, serving as a commander at Washington and in the Pacific until his discharge in 1946.

Leaving the Navy, Mr. Demambro again turned his attention to industry, purchasing the Curtis Machines Corporation of Jamestown, New York, maker of abrasive belt sanding, grinding and polishing machines. In 1946 Curtis Machine was merged with Lincoln Park Industries, maker of high precision carbide dies and gages, and in February 1949 the organization was further expanded by the purchase of the Standard Portable Cord Company of Lincoln Park, Michigan, maker of portable cord trouble lights, motor cords and harnesses, extension cords and components. To provide greater plant facilities, more efficient production and management coordination, the Standard Portable Cord operation was moved to Jamestown, as were the executive, sales and general offices of the corporation.

Two New Appointments Made by L. S. Starrett Company

The L. S. Starrett Co., Athol, Mass., has announced the appointment of Harry E. Masters as educational director in charge of all vocational education and industrial apprentice training programs and activities, as well as all trade shows and conventions. Mr. Masters is widely known among educators and brings to this full-time position more than forty years' experience in sales, educational work, and advertising, the last 20 years as advertising manager.

The company has also announced the appointment of C. G. Nordmark as

Harry E. Masters (left) and C. G. Nordmark

advertising manager. Mr. Nordmark previously served as advertising manager of the Lord Mfg. Co., Erie, Pa., and assistant publicity director of The Heald Machine Co., Worcester, Mass.

Norton Company Elects Officers

Milton F. Beecher, formerly director of research at the Norton Company since 1941, was elected vice president in charge of research and development by Norton Company stockholders at their 64th annual meeting. Directors of the company re-elected George N. Jeppson as board chairman and Milton P. Higgins as company president. Ralph F. Gow, executive vice presi-

SMOOTH AS A GUN BARREL!

Super Finish Bore on Universal Drill Bushings Lengthens Bushing Life, Reduces Tool Breakage

To super finish I. D., add such plus features as blended radius, knurled head, I. D. break, chamfered O. D., and you have the reasons why Universal Drill Bushings are specified by many of America's leading manufacturers. Universal provides extra prompt sectional delivery and information from warehouses at 1060 Broad Street, Newark, N. J., and 5035 Sixth Ave., Kenosha, Wis. Write, call or wire today!

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 9, MICHIGAN

dent of the Norton Company, was elected vice president of the Norton Pike Company, and Ralph M. Johnson, vice president in charge of sales for the Norton Company, was named to the Norton Pike Company board.

Lyon Metal Elects New Board Chairman and President

At the regular meeting of the board of directors of Lyon Metal Products, Inc., Aurora, Ill., Earl D. Power was elected chairman of the board to succeed B. L. Waters, and H. B. Spackman was elected president to replace Mr. Power. In his new capacity as chairman of the board, Mr. Power will continue to be the active chief executive officer of the company and chairman of the executive committee. He will also exercise direct functional control over several phases of company operation.

In his new position as the president, Mr. Spackman will be vice chairman of the executive committee. He will directly supervise the sales, production, development and engineering divisions of the company and be responsible for the proper coordination of the functions and operations of all departments.

With these changes in top management, the company has also announced the promotion of J. M. Olesen to general sales manager in which capacity he will be in charge of all sales and advertising activities of the company.

Williams & Hussey New Owners of O. K. Tool Company

Thurston Williams, vice president and treasurer of the Williams & Hussey Machine Company, recent purchaser of the O. K. Tool Co., Shelton, Conn., has announced that all manufacturing at Shelton has ceased and is now being conducted at Wilton, N. H.

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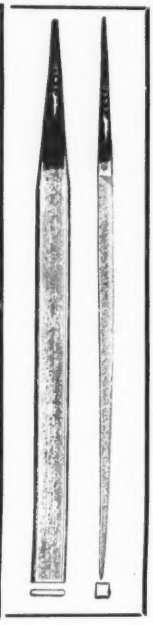
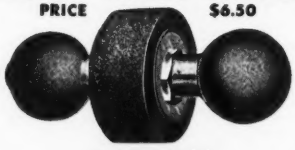


METCALF WHEEL DRESSERS
PRICE $6.50



PRODUCE
SHARP—CLEAN—
WHEEL FACES

Fast, efficient cutting action of grinding wheels is assured because of these Metcalf principles:

HIGH SPEED GYROSCOPIC ACTION
EXTRA LARGE, HEAVY, BALL-TYPE HANDLES FOR BALANCE
FAST CRUSHING AND FORMING BECAUSE OF ABRASIVE TRUING WHEEL

A minute with a Metcalf saves hours of production time. Extra wheels, $1.25 each.

HANCHETT MANUFACTURING CO.
Manufacturers of Saw and Knife Machinery
Dept. MM-30 BIG RAPIDS, MICHIGAN

The tool company, established in 1901, will retain its identity and operate as a division of Williams & Hussey Machine Company, which is exclusively owned and operated under the personal supervision of Thurston Williams and Forrest Hussey.

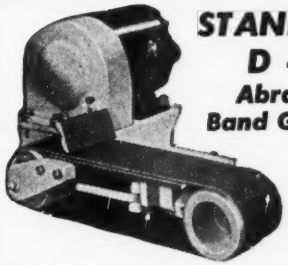
In addition to the modern equipment already available at Wilton, nearly $200,000 will be invested in new machinery. The key personnel, engineering and sales staff of O. K. Tool will remain intact.

Renewing Process for Phillips Screw Drivers and Bits

The Zephyr Mfg. Co., 201 Hindry Ave., Inglewood, Calif., has announced a method of renewing Phillips screw drivers and screw driver bits that have become worn or broken in service. Drivers renewed by this process conform to Phillips design and are said to equal new tools in service. Original hardness is not affected by the process, although length is slightly reduced. Most drivers can be repeatedly renewed by the process, with the renewed drivers conforming to original design and tolerances.

U. S. Steel Scientists Pool Data on High-Temperature Steels

Leading research scientists of United States Steel Corporation's subsidiary companies have pooled their findings and data on high-temperature steels. The result is a practical 87-page illustrated booklet, "Steels for Elevated Temperature Service," available through the Carnegie - Illinois Steel Corporation, Pittsburgh, for the use of engineers, chemists and metallurgists in the power, transportation and chemical process industries, as well as those interested in the design of jet engines, rockets, and gas turbines.



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OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING—WRITE TODAY

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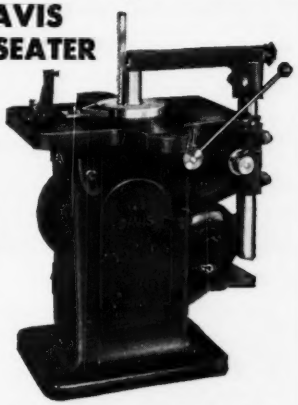
306 E. 38th St., New York 16, N. Y.

Why Use A Shaper to cut Keyways when a DAVIS KEYSEATER will do the job so much quicker and better?



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DAVIS KEYSEATER CO.
Exchange and Glasgow Sts.
ROCHESTER, N. Y.

George H. Hodapp Becomes New President of Heller Brothers

At a recent meeting of the board of directors, George H. Hodapp was elected president of the Heller Brothers Company, manufacturer of files, hammers, trowels, and other hand tools, with factories in Newcomerstown, Ohio, and Newark, N. J. In addition, James G. Henry, Jr., was elected vice president and secretary; Miss Anna W. Ibach, treasurer, and Eugene M. Steenburgh, assistant secretary.

Garett Expands

The George K. Garrett Company has started a new expansion program to enlarge its production facilities. The first step in this program is a new plant located in Elwood City, Penna.

The new one-story plant covers more than 50,000 square feet of manufacturing space and is located on a plot of ground seven acres in size thus allowing for future expansion. Equipped with the most modern types of machinery available, the plant will be used in the quantity production of flat washers of all types, small and medium stampings and complete assemblies.

Metalwash Opens New Plant

Metalwash Machinery Corporation, formerly of 148 Shaw Ave., Irvington, N. J., has announced the opening of a new plant on U. S. Route 1 at North Avenue in Elizabeth, N. J. The plant, located on a 4½-acre tract, is served by all means of transportation, being alongside Newark Airport and convenient to the Newark railroad stations. In addition, the highway location provides easy access by automobile.

The manufacturing area of more than 30,000 square feet is served by traveling cranes with capacities up to 35 tons, as well as railroad sidings. New machinery has been installed to

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The inherent hardness and durability of granite accurately finished to a guaranteed tolerance o .00005", provide the most efficient and economical surface plates for precision measurement operations. Sizes up to 8' x 16'.

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SAVE 90% CHECKING TIME

WHEN BUILDING DIES

This new method of checking tapers on dies does away with die squares and height gauges.

Write for complete details.

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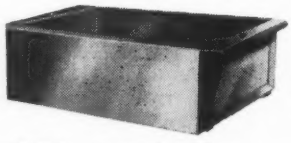
318 N. Main St., Englewood, Ohio

IMMEDIATE SHIPMENT --- QUALITY STACKING BOXES



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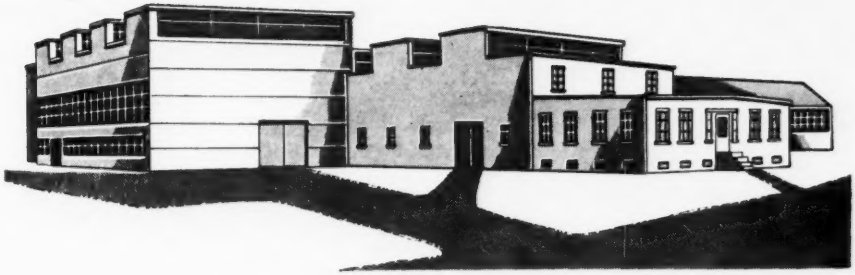
All Prices F.O.B. Factory

FEATURES: rigid handle and hook hole each end. Sturdy all-welded construction. Heavy skids act as positive stacking lock.

Product Number	Width	Length	Height	Gauge Steel	Price Plain	Price Green
601-18	10"	16"	6"	18	$1.35	$1.50
603-18	12"	18"	6"	18	$1.60	$1.80

BAY METAL PRODUCTS
3015 N. 16TH ST. PHILADELPHIA 32, PA.
PHONE . WIRE . WRITE . . . Telephone BAldwin 9-1805

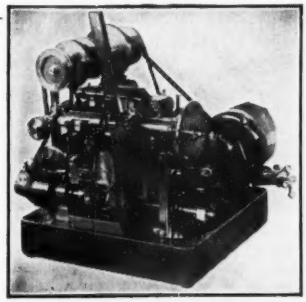


New Plant of Metalwash Machinery Corporation

provide better and more economical manufacture. These improved facilities will enable the corporation to produce its industrial washing machines, dryers, pickling machines, quench tanks and draw furnaces, bakery pan and rack washing machines, pot washers, and special machinery at an increasing rate. The plant has a two-story air conditioned office building containing executive offices, as well as purchasing, sales, engineering, and accounting departments.

Annual Doehler Award

The Doehler-Jarvis Corporation has donated $25,000 for the establishment of a perpetual trust to be known as the Annual Doehler Award Fund and



WALTHAM

Pinion and Gear Cutting Machines

with revolving cutter will make 1, 2 or 3 successive cuts for watch pinions or may be used for fine pitch gears up to 1½" dia. Blanks are held and indexed by work spindle and usually supported by a tail center. Only straight teeth can be cut. *Write for Bulletin No. 112.*

WALTHAM MACHINE WORKS

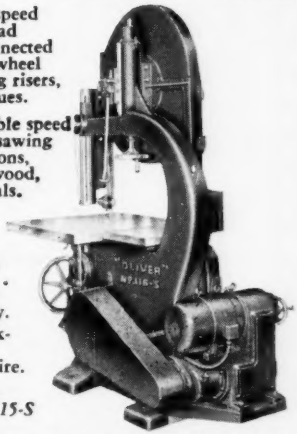
WALTHAM MASS.

Pinion and Gear Cutting Machine, Thread Milling Machine, Cylindrical Sub-Presses, Cutter Sharpening Machine, Small thread milling and gear cutters, Small special machinery.

"OLIVER" 38-INCH METAL-CUTTING BAND SAW

Has low speed geared head direct connected to lower wheel for cutting risers, gates, sprues.

Has variable speed drive for sawing compositions, plastics, wood, sheet metals.



Powerful, sturdy . . . cuts true and steady.

Has quick-change rim and tire.

Write for Bulletin 115-S

Oliver Machinery Co., Grand Rapids 2, Mich.

has appointed the American Die Casting Institute as trustee of the fund. The award, which is to be made annually for outstanding contributions to the advancement of the die casting industry or the art of die casting, will consist of a suitable plaque and a cash honorarium of at least $500, or more if the income of the fund permits and at the discretion of the award committee. This committee consists of the board of directors of the American Die Casting Institute and has sole authority over the selection of the recipient and the operation of the award program.

Complete information regarding eligibility for the award, selection of recipient, award presentation, and submission of entries may be obtained by writing to the Award Committee, American Die Casting Institute, 366 Madison Ave., New York 17, New York.

New Distribution Policy for Tap Chucks and Drill Drivers

Scully-Jones & Co., 1909 S. Rockwell St., Chicago 8, Ill., has announced a new distribution policy for its Style B tap chucks and drill drivers only. Effective immediately, these tools are available to all jobbers, mill supply houses, and other resale outlets handling a line of drills and taps. This departure from previous practice is in the interest of better service to the metal working industry.

Wilber J. Kupfrian Establishes New Company

Wilbur J. Kupfrian, part owner and engineering director of the Elliott Mfg. Co., Binghamton, N. Y., has resigned from the firm to establish the Kupfrian Manufacturing Company with offices at the same address. Two separate manufacturing plants have been set up

REID
SURFACE GRINDERS
10,000 IN USE
THEY HAD TO BE GOOD TO BE SO FAVORABLY KNOWN FOR SO LONG
Established 50 Years
REID BROTHERS CO., INC.
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CARROLL
DIVIDING HEADS
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3 SIZES - 4 MODELS - 6" to 12"
TROYKE MFG. CO.
4422 APPLETON ST. CINCINNATI 9, OHIO

FLYNN

FOR OVER 30 YEARS THE PREFERRED OFFSET BORING HEAD
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FLYNN MANUFACTURING CO.
437 BATES STREET • DETROIT 26, MICHIGAN

in Binghamton and Deposit, New York.

The new organization is successor to the Special Products Division of the Elliott Mfg. Company and will devote its facilities chiefly to the manufacture of flexible shaft couplings, remote controls, and wire shielding, particularly for the electronics and instrumentation fields. Other products to be offered include Monocoil (Bowden) casing and push-pull controls for the marine, automotive and industrial fields.

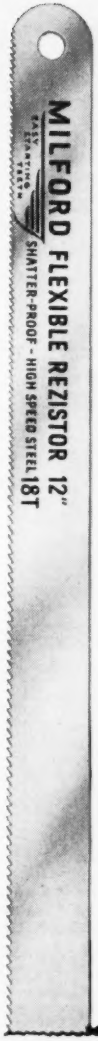
Skilsaw Holds Annual Sales Meeting

New tool introductions and accelerated merchandising programs for 1950 were highlights of the annual sales meeting of Skilsaw, Inc., held recently at the Edgewater Beach Hotel, Chicago. Backing up the meeting theme, "A bigger cut in 1950," several completely new Skil tools were presented to 92 men gathered from Skilsaw's 33 branches in the United States and Canada. Modernized versions of many tools in the company's line were also shown.

Guest speakers during the meeting were Arthur H. Motley, publisher, and Benjamin Bills, Chicago realtor and educator.

American Air Filter Company and Herman Nelson Corporation Merge

The merger of the American Air Filter Co., Inc., Louisville, Ky., manufacturer of air filters and dust collectors, and the Herman Nelson Corp., Moline, Ill., producer of heating and ventilating equipment, has been announced by W. M. Reed, president of American Air Filter. The Nelson Corporation will henceforth be operated as the Herman Nelson Division of American Air Filter Co., Inc., and will continue to maintain its headquarters



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FLEXIBLE
REZISTOR
MEANS
LONGER
BLADE LIFE

Depend on the MILFORD Flexible REZISTOR to deliver its full cutting life without premature breakage — to last up to ten times longer than standard steel blades. The Flexible REZISTOR is shatter-proof — no flying fragments to injure the operator. Exclusive MILFORD Easy-Starting Teeth start the cut on the first stroke at any angle — prevent jamming by keeping the cut free and clear of chips. Teeth are as hard as those of any power blade; the back is tough and flexible. See your nearby MILFORD Distributor about Flexible REZISTORS today!

This booklet tells you more. Get your copy, and literature on the complete line, from your Milford Distributor today. Or, write direct to the factory — TODAY.

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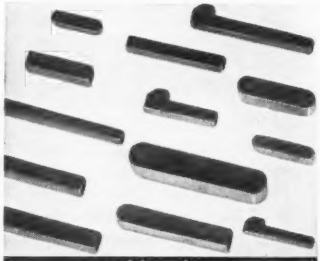
Saw Specialists Exclusively For Over 70 Years
NEW HAVEN 5, CONNECTICUT, U.S.A.

Profile and Band Saw Blades — MILFORD — Rezistor & Duplex Hack Saw Blades

SOLD THROUGH SELECT INDUSTRIAL DISTRIBUTORS

and facilities in Moline. The merger company's principal offices and headquarters will be in Louisville, Ky.

W. G. Frank, executive vice president, and Richard H. Nelson have been elected directors of the combined firm. Richard H. Nelson and Robert W. Nelson have been elected vice presidents of the enlarged firm and E. G. Mason of the Herman Nelson Division has been elected assistant secretary and assistant treasurer.



● For 30 years we have provided prompt, dependable service for all types of standard machine keys, including gib head, taper, straight and round end feather keys. Furnished completely finished in all types of metals to any tolerance ready for assembly. Also suppliers of groove and taper pins, Woodruff keys and special parts.

WRITE FOR BULLETIN AND PRICES

JOHN GILLEN CO., INC.
2542 S. 50TH AVE. CICERO 50, ILL.

Rivett Lathe & Grinder, Inc. Acquires Gerotor Valves and Cylinders

Rivett Lathe & Grinder, Inc., Boston, Mass., has announced the purchase of the entire line of Gerotor air and hydraulic valves, cylinders and hydraulic power units from the Gerotor May Corp., Baltimore, Md. All manufacturing and selling operations of the line have been transferred to Boston. The Gerotor May Corporation is retaining the manufacture and sale of Gerotor hydraulic pumps and fluid motors at Baltimore, Maryland.

The new Rivett line will be marketed through the present Gerotor dealer organization, which will likewise continue to handle Gerotor hydraulic pumps and fluid motors. Present plans call for the Gerotor trade name to identify the new Rivett line. John A. Marsh, formerly special sales representative for the Gerotor May Corporation, is the new sales manager for the valve and cylinder division of Rivett Lathe & Grinder, Incorporated.

Lincoln Electric Announces Factory Parts Exchange Plan

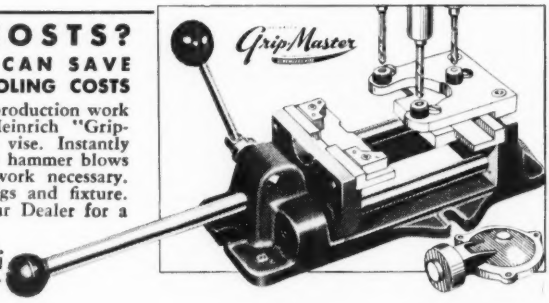
In order to have guaranteed factory-built stators, armatures and other parts available all over the country for welder repair service, The Lincoln Electric Co., Cleveland 1, Ohio, has established a welder parts exchange plan. Old parts may be traded in for

HAVE TO CUT COSTS?

THIS SCREWLESS VISE CAN SAVE YOU UP TO 75% ON TOOLING COSTS

Extra time and labor savings in production work can be yours when you use Heinrich "Grip-Master," the original screwless vise. Instantly adjustable; has positive lock that hammer blows cannot break. No leveling of work necessary. Ideal as a base structure for jigs and fixture. Write for free folder or ask your Dealer for a demonstration.

NATIONAL MACHINE TOOL CO.
Dept. 110-C, RACINE, WISCONSIN



factory wound stators, armatures and certain control parts.

This service is available through the 146 Lincoln authorized field service shops in principal cities in 44 different states. Factory trained men are available at each of these shops for the installation of exchange parts. In addition to exchange parts, field service shops also provide other welder parts, repair service, preventive service and rental service.

A directory of the 146 field service shops, together with a complete price list for exchange parts with description of the plan, is available from The Lincoln Electric Co., Cleveland 1, Ohio.

Cincinnati Industrialists Receive Copies of Replacement Manual

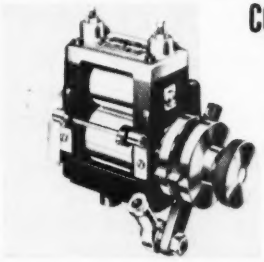
Two Cincinnati industrialists recently received copies of a book to which they had devoted many hours over the last three years. It is a manual to guide industrial executives in determining when a machine is economically dead and due for replacement. The Cincinnati men, who have been members of the Conference on Replacement Analysis of the Machinery and Allied Products Institute, Washington 6, D. C., the organization which published the manual, are Swan E. Bergstrom, vice president, Cincinnati Milling & Grinding Machines, Inc.; and William L. Dolle, president, The Lodge & Shipley Company.

The 75-page book, "MAPI Replacement Manual," was written by George Terborgh, Institute research director, in close collaboration with the Conference on Replacement Analysis. It presents a replacement formula with practical instructions for its application in an industrial company. The formula measures the imperfections of the performance of a machine in use in relation to the best alternative available.

Variable Ratio Pantographs
Pantograph Controlled
Profiling Vertical Millers

Engraves an area 5 by 5 inches on curved surfaces without special templates, with smooth lines in any design, number, letter; on iron, brass, copper, aluminum, soft steels and all plastics. • Drills a series of holes • Profiles small parts • Increases accuracy and production • Etches glass and similar items • Will not cause distortion.

AUTO ENGRAVER CO.
Florida Hill Rd., Ridgefield, Conn.



COMPLETE ROLL FEED — READY FOR MOUNTING
Model A-A --- $129.50

Feeds stock up to 1½" long and 2" wide.
Can't slip . . . Adjusts and reverses instantly. No pawls . . . No ratchets . . . Feeds in thousandths.

Write for circular and data sheet.

ROLL FEEDS CORP. MIDDLE ST. AT CENTRAL AVE. PAWTUCKET, R. I.
Builders of ELECTRIX Precision Die Miller

Founder of Disston Industry Honored by Newcomen Society

A tribute to the memory of Henry Disston, founder of Henry Disston & Sons, Inc., internationally known maker of saws, tools, and special alloy steels, was paid recently by more than 300 leaders of finance, science, and industry in the Great Hall of the Franklin Institute, Philadelphia, at the 244th Franklin birthday dinner of the Newcomen Society of England. The affair also celebrated the 110th anniversary of the founding of the Disston enterprise in Philadelphia in 1840.

Guest of honor and principal speaker was Jacob S. Disston, Jr., president of the firm founded by his grandfather and vice chairman of the Philadelphia Committee of the Newcomen Society. Ralph Kelly, president of the Philadelphia Chamber of Commerce and chairman of Newcomen's Philadelphia Committee, presided at the dinner. Among the guests were representatives of numerous American chapters of the Newcomen Society and nearly 40 members of the Disston family and officials of the Disston company.

Resistance Welding Contest

Cash awards totaling $2,250 will be made by the Resistance Welder Manufacturers' Association for outstanding papers dealing with resistance welding subjects. The contest is open to anyone, without restriction, from the United States, its possessions, and Canada. It is also open to any member of the American Welding Society in any grade.

The contest closes July 31, 1950, and awards will be made at the 1950 fall meeting of the American Welding Society. Complete information regarding prizes and contest rules can be obtained from the Resistance Welding Manufacturers' Association, 505 Arch St., Philadelphia 6, Pennsylvania.

DORMAN
AUTOMATIC REVERSE TAPPERS

- AUTOMATIC TORQUE CONTROL...One Minute to Adjust ...Prevents Tap Breakage... Operator Need Not Be Skilled
- WIDE RANGE TAP CAPACITY

No. 1 FRICTION DRIVE TAPPER—capacity #2-56 to ⅜" in Steel—½" in Aluminum.

No. 2B POSITIVE TAPPER—capacity ⅜" to ⅞" in Steel.

No. 3A POSITIVE TAPPER—capacity ½" to 1¼" in Steel—½" to ¾" Pipe Taps.

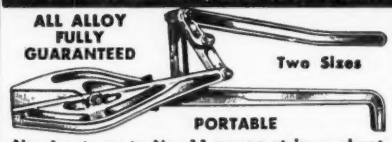
No. 4A TAPPER—capacity ¾" to 2" in Steel including Pipe Taps.

- IMMEDIATE DELIVERY

Priced from **$44.00**
Write for Bulletin

THRIFTMASTER PRODUCTS CORPORATION
Division of Thomson Industries, Inc.
1034 N. PLUM STREET, LANCASTER, PA.
STANDARD UNIVERSAL ADJUSTABLE AND SPECIAL FIXED CENTER DRILLHEADS

BREMIL
The IMPROVED Compound Lever Shears



No. 1 cuts up to No. 11 gauge strip or sheet.
No. 2 cuts up to ¼" steel plate.

BREMIL MFG. CO.
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ADVANCE CLAMPS
Cut Set-Up Time 75% on MILLING MACHINES
THE ONLY T-SLOT CLAMP
For use on all machines with T-slots.
Manufactured and sold by
ADVANCE MACHINE WORKS
FORT WAYNE 7, INDIANA

S. C. E. Awards Prize for Outstanding Article

At a recent meeting of the Society of Carbide Engineers, Thomas Hollis, newly elected president, announced that an award of $50,000 for the most outstanding article on the use of carbides had been made to Sidney Tower, foreman of Dept. 84, Pratt & Whitney Division of United Aircraft Corp. The decision to award Mr. Tower the prize was made unanimously by the committee appointed to select the prize-winning article.

Officers of the S. C. E. are: President, Thomas Hollis, Nelco Tool Company; vice president, Sidney Tower, Pratt & Whitney Division, United Aircraft Corporation; secretary, Edward P. Dublac, Firth Sterling Steel & Carbide Corporation, and treasurer, Harold Feingold, cutting tool engineer of Underwood-Elliott-Fisher. The executive committee includes the above officers plus Robert Warfel, Francis O'Sullivan, Bernard Blacker, Robert Hood, and William A. Coe, past president of the society.

Norton Transfers Members of Outside Sales Department

The Norton Co., Worcester, Mass., has announced the transfer of four members of its outside sales department. William C. Howard, formerly field engineer in the Hartford, Connecticut area, has been named abrasive engineer with headquarters in New Haven, Conn. He replaces J. Lawrence Tobey, who left the Norton Company to go into business with his father.

John W. McCue and F. Donald Wing will report to Raymond E. Taylor, district manager of the Chicago office, and Mr. Wheeler will replace Mr. Howard at Hartford, reporting to Connecticut district manager Ronald W. Price. All four men are recent graduates of the Norton Sales Training Course.

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IRON,
STEEL
and
CARBIDES
THE Etchgraph WAY
Original Electric Etcher. Thousands in Daily Use
Mark hardened parts, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides — quickly — plainly. • Three sizes to meet all requirements.
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ALL THE DATA YOU NEED...
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...at the flip of a single page
Make drill jig designing easier with this "Flip-a-page" catalog.
Free on Request
COLONIAL BUSHINGS INC.
P.O. BOX 37, HARPER STATION
DETROIT 13, MICHIGAN

A. S. L. E. 5th Annual Convention

The 5th Annual Convention of the American Society of Lubrication Engineers will be held at the Hotel Statler, Detroit, April 10, 11 and 12. The 3rd Annual Lubrication Exhibit of the society will be held at the Statler simultaneously.

Keynote of the convention will be "Preventive Maintenance through Proper Lubrication," pursuing the theme which attracted 1,200 design engineers, production engineers, maintenance engineers and plant managers to the national lubrication panel which was sponsored by the society in Cleveland on January 18. Prominent among the 21 speakers who will address the ten sessions of the convention are Dr. W. E. Campbell of the Bell Telephone Laboratories, whose subject will be "Lubrication of Electrical Contacts," and Dr. E. M. Kipp, of the Aluminum Company of America, who will discuss "Multi-Purpose Lubricants."

Ferner Establishes Engineering and Sales Department for Testing Equipment

The R. Y. Ferner Co., Boston 48, (Malden Station), Mass., has announced the establishment of a department for engineering and sales connected with a line of hardness measuring instruments of the portable type for metals, plastics, industrial finishes, and so on. Included in the line are the Dwarf Brinell Tester for the static method of testing and the Duroskop Hand Tester for the dynamic method of testing. Literature fully describing these instruments is available upon request.

The company is also offering dynamic and fatigue machines of various types and capacities made by Carl Schenck, Darmstadt, Germany. These machines can be used to simulate actual working conditions to disclose the strength, endurance, and so on, of metal cables, wires, forgings, gears,

TROYKE ROTARY TABLES

WORM WHEEL OPERATED ROTARY TABLES . . . .

9", 12", 15", 18", 21", 25"

BALL BEARING STATION INDEXING TABLES . . .

12", 15", 18"

See your dealer or write for Catalog 14.

TROYKE MFG. CO.
Cincinnati 9, Ohio, U. S. A.

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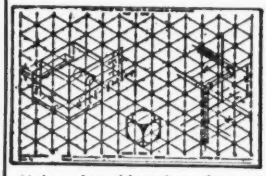
DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
Wilmerding, Pa.

ISOMETRIC SKETCHES ARE



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One trial will make you another steady user of WADE'S ISOMETRIC blue lined paper. Shows all surfaces and interior to scale. Makes clear blueprints. Saves time daily in hundreds of plants. *Write for Circular.*

Wade Instrument Co. **Dept. H, R.F.D. #1 Chardon, Ohio**

machine parts, and other items, as well as aircraft and engine assemblies, weldments, or odd-shaped structural units. Complete descriptions of these machines will be sent upon request.

Tap Sharpening Service

As a service to those desiring to prolong the useful life of their taps, as well as to firms that cannot afford to purchase tap sharpening equipment, the Edward Blake Co., 437 Cherry St., West Newton 65, Mass., has established a tap sharpening department in which dull taps can be economically resharpened to provide accurately indexed cutting edges, uniform and correct rake angles for the cutting teeth, and uniformly relieved chamfers.

Taps to be sharpened may be shipped direct to the Tap Service Department of the company at the address given above and will be returned by mail or express. Tap service order forms are available upon request.

Patent Classification Index In A. F. Davis Welding Library

The department of welding engineering at Ohio State University, Columbus, Ohio, has announced the completion of a new patent classification index in the A. F. Davis Welding Library, designed to make information on more than 12,000 U. S. patents on welding more easily available to industry and educational institutions. The index covers not only the fundamental patents on welding processes and equipment but also the very important field of industrial applications of the welding processes.

The use of the patent classification system is offered to industrial organizations. Services are free of charge to those who make use of the index system in person; however, modest charges to defray clerical expense will be made for inquiries handled by mail.

HAND SPRING WINDER

NO LATHE NECESSARY

1. 60 second action for a spring 12" long.
2. Ideal for tool room and maintenance shop.
3. Mandrel capacity to 1½".
4. Wire capacity up to .229" diameter.
5. Pitch capacity up to 1".
6. Clamps in your bench vise.

4 SIZES
Priced from
$15 to $35

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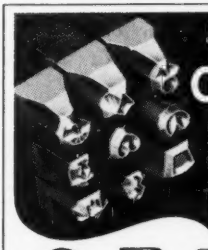

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CODE MARKING
with
"SAFETY"
SYMBOL STAMPS

"Safety" code symbol stamps simplify inspection and piece work identification marking. Write today for data on stock or specially designed stamps for your coding requirements.

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SAFETY STEEL STAMPS
158 East Carson Street · Pittsburgh 19, Pa.

European Machine Tools and Measuring Instruments Introduced By George Scherr Company

As a result of an extended trip to Europe by George Scherr, president of the George Scherr Co., Inc., New York, N. Y., during which trade exhibitions in Frankfurt, Germany; Milano, Italy; Basel, Switzerland; Brussels and Liege, Belgium, were visited, the following machine tools and instruments have been introduced in the United States by the company:

(1) Swiss watchmaking machinery consisting of a set of five precision machines: gear and pinion cutting machine for cutting pinions up to ¼-inch diameter with magazine feed; cutter sharpening machine for small diameter cutters; pivot burnish or rolling machine; tooth polishing machine; and riveting machine to assemble gears on their shafts.

(2) Gear hobbing machine of the universal type with tangential feed for cutting spur gears, spiral gears, and gears up to 20 inches in diameter and 6 diametral pitch.

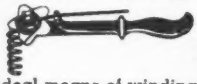
(3) Keopfer universal gear hobbing machine with automatic cycle for small spur, spiral, and worm gears from $\frac{3}{16}$ to 4¾ inches in diameter, 82 to 12 diametral pitch.

(4) Cornelis thread generating machine intended for cutting lead screws, worms, and threads by means of a generating method using a circular cutter. This machine is available in four standard lengths of 18, 37, 77, and 116 inches.

(5) Leitz optical jig borer with optical setting and microscope inspection through the spindle for work within a range of 6 x 6 inches where maximum precision is essential.

(6) Shop microscopes, measuring microscopes, toolmakers' microscopes, surface finish comparison microscopes, bore inspection telescopes, and alignment telescopes for the measuring and

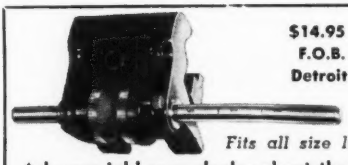
A Real Spring Winder!



Will earn its cost in one day. The Hjorth Perfection Spring Winder offers the ideal means of winding extension, compression, torsion, taper, double taper, or left hand springs. Try one in your shop. You'll like it and the price is reasonable.

No. 1 Capacity 0 thru 3/32" wire $1.50
No. 2 Capacity 0 thru 3/16" wire $3.00
No. 3 Capacity 0 thru 5/16" wire $5.00

HJORTH LATHE & TOOL CO.
10 BEACON STREET WOBURN, MASS.

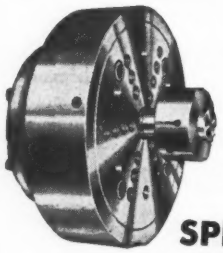


$14.95 F.O.B. Detroit

Fits all size lathes.

Ask your jobber or dealer about the time-saving features of the HARPER LATHE CARRIAGE SPACER . . . or write for descriptive folder.

ELLWOOD PRODUCTS CO.
3049 E. Grand Blvd. Detroit 2, Mich.



OTHERS HAVE DONE IT, WHY HAVEN'T YOU

gotten out of the rut and into the groove, by using SPEEDGRIP PRECISION INTERNAL CHUCKS for second operation work? Layouts will be made and prices quoted if prints are submitted. Send for descriptive folder today.

SPEEDGRIP CHUCK, INC. 1102 W. Beardsley Ave. Elkhart, Indiana

inspection of gages, form tools, cutters, threads, screws, taps, dies, and so on.

(7) Leitz Opti-Comparator, an optical comparator gage which is set to zero by means of precision gage blocks. A beam of light is used to amplify the movement of the feeler point with accuracy of 10 millionths of an inch.

Bulletins describing in detail the various machines and instruments mentioned above are available by writing to the George Scherr Co., Inc., 198-A Lafayette St., New York 12, N. Y.

AMF Improves Wahlstrom Drill Chuck Packaging

The Wahlstrom Tool Division, American Machine & Foundry Co., 5502 Second Ave., Brooklyn 20, N. Y.,

New Packaging for AMF Wahlstrom Drill Chuck

has redesigned the packaging for its fully-automatic drill chucks. The new red, white and black metal-edge box is said to be a vast improvement in design and construction over the previous plain containers with their pasted-on labels. The new container is claimed to be stronger, afford greater protection to the chuck, and lend itself to quick and easy trade mark and brand name identification. Model, capacity and shank size are shown on the end of the box for quick location on shelves.

TRY a gallon of Protect-O-Metal No. 2 . . . . . at our risk*

GET better, cleaner welds for less money

SAVE up to **85%**

. . . of weld cleaning costs

Brush or spray Protect-O-Metal No. 2 on weld seam and on adjacent metal . . . weld . . . then simply wipe off spatter with a dry cloth. Don't waste time, manpower, or profits cleaning up welds with air chisels, wire brushing or sand blasting. Protect-O-Metal No. 2 is the *one* smokeless, odorless, spatter proofing compound. Costs about 1/10¢ per foot of weld, saves up to three times its cost.

PROTECT-O-METAL No. 2
G. W. Smith & Sons, Inc.
5407 Kemp Road, Dayton 3, Ohio
*O.K. Send me a trial gallon of PROTECT-O-METAL No. 2 and a bill for $3.15. I understand you will cancel the invoice if I'm not entirely satisfied.
Name.....
Firm.....
Address.....

Did You Know?---

The Link-Belt Company has announced that **H. Walter Regensburger** has been appointed chief engineer of its General Engineering Department to succeed **Harry L. Strube,** who has retired. The department has been transferred from Philadelphia to 301 West Pershing Road, Chicago. Assisting Mr. Regensburger will be **Charles M. Young, Jr.,** in the capacity of chief development engineer, and Harold F. Watson as chief standards engineer.

— o —

John C. Ewer, Norton Company abrasive engineer in the Boston district, has been appoitned general manager of Norton Grinding Wheel Co., Ltd., Welwyn Garden City, Herts, England, **Raymond J. Forkey,** abrasive engineer in Rochester, New York, will take over the district vacated by Mr. Ewer.

— o —

Vanadium-Alloys Steel Co., Latrobe, Pa., has announced the selection of **Harry M. Reed** as a director, replacing Alexander Nimick, Sr., deceased. Mr. Reed has been associated with the company since 1925 and was elected secretary in September 1947.

F. J. Sikorovsky has been elected president of the Federal Drill and Tool Works, manufacturer of aircraft tools, New York, N. Y., a division of Alvildsen Tools and Machines, Inc. He was also elected a member of the board of directors of Alvildsen Tools and Machines, Inc., which operates plants in Chicago and New York making twist drills, reamers, end mills and toolmaking equipment.

— o —

The National Rolled Thread Die Co., Cleveland, Ohio, has appointed **L. C. Bigelow, & Co.,** Inc., 250 W. 54th St., New York, N. Y., as exclusive representative for the sale of National Super Thread Rolling Dies in Metropolitan New York and the western half of Connecticut.

— o —

Morse Chain Co., Division of Borg-Warner Corp., has announced the appointment of the **J. A. Shomer Co.,** 11201 Berea Rd., Cleveland 2, Ohio, as distributor in the Cleveland area for Morse mechanical power transmission products.

— o —

Leon F. Miller, formerly sales manager, has been elected vice president in charge of sales and engineering of the Foundry Machinery Division of The Osborn Mfg. Co., Cleveland, Ohio.

STANDARD

TAPER PINS

The high quality and accuracy of Standard Steel Specialty Taper Pins have won them wide acceptance. Milled from bar stock, straight to taper and to extremely close tolerances, these pins give 100% performance. The uniformity and accuracy of the pins saves valuable time at assembly, assuring you trouble free service.

Write for complete catalog giving information on taper pins, Woodruff keys, machine keys and machine racks.

STANDARD STEEL SPECIALTY COMPANY

BEAVER FALLS PENNSYLVANIA

PLANTS: BEAVER FALLS, PA. • HAMMOND, IND.

FOR FASTER, SAFER SOLDERING

The Luma resistance method of soldering is the accepted way for small shops requiring single operation to large plants with many types of operations. Write for complete information about this remarkable tool.

LUMA ELECTRIC EQUIPMENT CO.

P. O. Box 132-M.S. Toledo 1, Ohio

Did You Know?---

Ampco Metal, Inc., Milwaukee, Wis., has announced the appointment of the following concerns as exclusive stocking distributors, in their respective areas, for the complete line of Ampco centrifugal pumps: Walter H. Eagen Co., Inc., Philadelphia; Kerr Machinery Co., Detroit; Pump Engineering Co., Los Angeles; Jackson Engineering Co., Indianapolis; Diehl Pump & Supply Co., Louisville; Ramsay Pump & Supply Co., Pittsburgh; Westco Pump Sales Co., San Francisco; Trustcott Co., Portland, Ore.; Southern Engine & Pump Co., Houston (branch sales offices in Dallas, San Antonio, Kilgore and Edinburg, Texas); McLellan A-C Supply Co., New Orleans; J. J. Heinrikson & Son, Kansas City, Mo.; Connecticut Pump Co., North Haven; Chase Pump & Equipment Co., Providence; and Ryan Hydraulic Specialties Co., Phoenix, Arizona.

— o —

The Hartford Special Machinery Co., Hartford 5, Conn., has announced the appointment of three new representatives for its line of automatic drilling and tapping machines, thread rolling machines, and die polishing machines: **Woodall Engineering & Sales Co.,** 910 Winters Bank Bldg., Dayton 2, Ohio, for the southern Ohio territory; **McBeth Machinery Co.,** 330 Grant St., 1109 Grant Bldg., Pittsburgh 19, Pa., for western Pennsylvania; and **Garco Machinery Co.,** 7702 Carnegie Ave., Cleveland 3, Ohio, for northeastern Ohio.

— o —

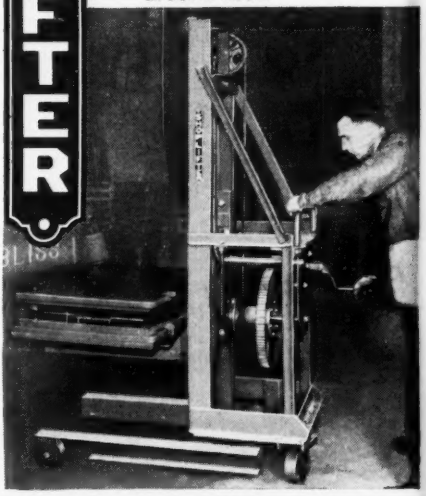
John Jeppson, assistant secretary and a director of the Norton Co., Worcester, Mass., has been appointed works manager of the company's Abrasive Division. **Frank G. Gifford,** manager of wheel plants, now expands his responsibilities to include all of the manufacturing operations in Plant 7 previously under the separate management of Mr. Jeppson. **John R. Bergman,** assistant superintendent of Plant 7, becomes the new superintendent of the plant, reporting to Mr. Gifford.

— o —

George L. Carr, for the past 13 years with Apex Broach Company, has resigned as vice president and sales manager of that company and has been appointed assistant to the sales manager of Colonial Broach Company, Detroit, in charge of estimating. Prior to joining Apex, Mr. Carr spent 13 years in sales engineering activities for Arrow Tool and Reamer Company.

SHOPLIFTER

. . . let an Economy SHOPLIFTER do the heavy work around here.



Every shop needs a SHOPLIFTER. Saves men, saves materials. Besides handling heavy dies, the SHOPLIFTER can stack drums and boxes, unload street trucks, pick up skids and be used as an adjustable height table.

All steel, arc welded frame. Easily operated hoist unit with automatic brake, safely holds load at any height.

500 pound capacity
Type D, hand operated.....$157.50
Type DE, electric 1/3 HP unit.....$315.00
1000 pound capacity
Type DX, hand operated.....$320.00
2000 pound capacity
Type DX, hand operated.....$370.00
Floor lock to hold machine steady:
$10.00 extra for 500 pound sizes;
$15.00 extra for type DX models.

ECONOMY ENGINEERING COMPANY
4507 W. LAKE STREET • CHICAGO 24, ILL.

Did You Know?---

The Wales-Strippit Corp., 345 Payne Ave., North Tonawanda, N. Y., has announced the appointment of the **E. W. Bliss Co.**, New York, N. Y., as exclusive foreign agent for the Wales Sheet Metal Fabricator, a machine that is said to punch, notch, and nibble angles, channels, and sheets up to ¼ inch thick at a rate of 165 strokes a minute.

—o—

Ferracute Machine Co., Bridgeton, N. J., has announced the appointment of **G. W. Brunton & Son,** 2882 Delaware Ave., Kenmore, N. Y., as representative in the Buffalo-Rochester area and the **H. A. Smith Machinery Co.,** 609 Syracuse-Kemper Bldg., Syracuse 2, N. Y., as representative in the Syracuse area for the complete line of Ferracute power presses.

—o—

Stover Lock Nut & Machinery Corporation has announced the purchase of a new and larger plant at Hilton & Holly Streets, Easton, Pa. All operations are now being conducted at the new plant, where the firm manufactures the patented Stover Lock Nut.

G. R. Carrier, 1815 W. 95th St., Chicago, Ill., has been appointed exclusive representative for Hydro--Line air and hydraulic cylinders and special machinery in the Chicago and northern Illinois territory.

—o—

The appointment of **David Kirk Stuart** as manager of the Pittsburgh branch of the Crucible Steel Company of America and **Richard J. Rand** as assistant branch manager has been announced by W. H. Wiewel, vice president in charge of sales.

—o—

Frank Sullivan has joined Chicago-Latrobe, Chicago, Ill., as a sales and service representative for the New England territory.

—o—

Opening of a sales office at 410 W. First St., Dayton, Ohio, has been announced by Cutler-Hammer, Inc., Milwaukee, Wis., electrical manufacturer. **P. L. Erickson** will manage the office as a branch of the company's Cincinnati district sales office.

—o—

The **E. V. Prentice Co.,** 2303 N. Randolph Ave., Portland 12, Ore., has been appointed exclusive Pacific Northwest sales representative of the R. D. Wood Co., Philadelphia 5, Pa., manufacturer of hydraulic presses.

MAUSER "THE ORIGINAL"
MAUSER-PRECISION VERNIER CALIPER
$14.75 POSTPAID
FOR MEASURING INSIDE, OUTSIDE AND DEPTH!!
THE MOST POPULAR MEASURING TOOL IN AMERICA... USED BY THOUSANDS OF MECHANICS DAILY!
REQUEST ILLUSTRATED CATALOG OR SEND YOUR ORDER TODAY!
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See Our Exhibit—Tool Engineers' Show—April 10th—Philadelphia—Booth 209

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SPECIAL EQUIPMENT FOR
High Quality
TAPER GRINDING
Taper Rods
Taper Mandrels
Up to 1/2" Diameter
Lengths up to 8 Ft.
STRAIGHT RODS
Up to 3/4" Diameter
Lengths up to 12 Ft.
Complete Centerless Grinding Service since 1931
COMMERCIAL CENTERLESS GRINDING CO.
6605 Cedar Ave., Phone: EN 3417, CLEVELAND 3, O.

Did You Know?---

C. J. Marlett, representative for Kennametal Inc. in the Chicago district during the past seven years, has been transferred to the engineering department of the company at Labrobe, Pa., where, as project engineer, he will be engaged in research and development on new applications of Kennametal.

— o —

The Whiton Machine Co., New London, Conn., has announced that **O. D. H. Bentley** has joined the company as consulting engineer on steam turbines. **Eugene B. Williams** has been appointed to take charge of the sale of Whiton steam turbines for U. S. Navy applications.

— o —

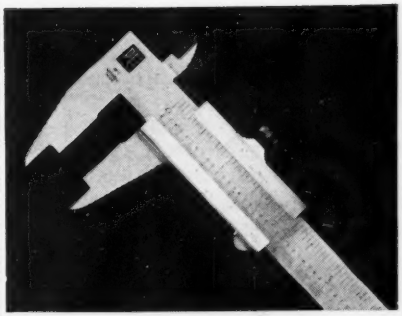
Dudley Cohen, 116 W. 72nd St., New York 23, N. Y., has been appointed sales representative in the Metropolitan New York area for Metal Seal & Products, Inc., Euclid, Ohio, manufacturer of the "Augur Movement" power transmission unit.

— o —

The Roto-Finish Company has transferred its operations from Sturgis, Michigan, to a new modern plant at Kalamazoo, Michigan.

— o —

P. M. McManus has been appointed general sales manager of Templeton, Kenly & Co., Chicago, Ill., manufacturer of Simplex jacks.



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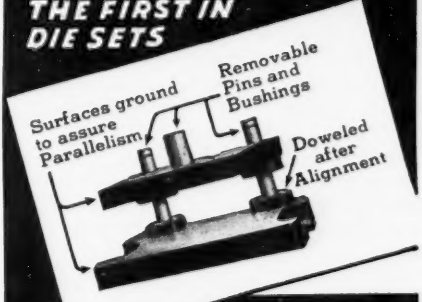

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The Challenge of Science and Technology to Management

An address* given by L. A. DuBridge, President, California Institute of Technology, Pasadena, before the General Management Conference of the American Management Association

ADVANCES in technology have been forcing human beings to adapt themselves to a future that is different from the past for at least the last 100,000 years. New advances in the art of making or controlling fire, of fabricating spear heads or cooking utensils, the development of new gadgets to assist the hunter or the farmer, these and hundreds of other new ideas or techniques to increase or improve man's control over his environment are the things that have marked the evolution of man from his primeval state to his present state or so-called civilization. Technology **is** the difference between civilized and uncivilized man.

We sometimes like to feed our own egotism by claiming that technology is a child of the 20th century—or at least of the last two or three centuries. This, of course, is wholly untrue—or at least it becomes true only if we adopt a very special meaning for the word "technology". But if we accept the dictionary's definition of technology as "systematic knowledge of the practical arts", then technology is surely as old as the arts themselves—and these date back to the beginning of the era when human beings could be recognized as such. For hundreds of **millenia** before the dawn of history, technology was slowly developing. The dawn of history itself coincides, by definition, with one of the most important technological discoveries of all time—the art of representing an idea by a symbol inscribed permanently on a surface. We call it the art of writing.

That single discovery has done more to change civilization—in the modern sense even to create it—than any other discovery before or since. For when facts or ideas were freed from the limitation of verbal communication—and hence from the vagaries and limitations of human memory—and could be passed unchanged from person to person and generation to generation, then and only then did a real growth of systematic knowledge become possible. Then and only then did the

* *Delivered at Hotel St. Francis, San Francisco, California, January 20, 1950.*

growth of knowledge become really cumulative.

One important consequence of this discovery was, of course, the great acceleration of the **rate of growth** of technology. Technology grows not only—and not chiefly—from the sudden birth of a brand-new idea for a new gadget or new technique. Usually it advances by someone putting together two or more apparently unrelated ideas. When ideas can be written down we increase enormously the chance of someone being able to bring together two or more ideas which might have originated from each other in space or in time.

Furthermore, the development of writing did one more thing which has been essential to civilization—an essential to our story today. It made possible the accumulation of **abstract** ideas and the development of **abstract** thought. It was easy enough for a father to pass on to his son by word of mouth and by demonstration a technique for making arrows, or making a shelter, or tilling the soil. It was not so easy for an exceptionally gifted father to communicate his ideas about the nature of the world and of man to a less gifted son. And so many a profound thought must have died for lack of an understanding ear. But as the art of written language developed one genius was able to speak to another across the whole world or across centuries of time and art, music, philosophy, religion, and eventually science. all became possible. And when finally the printing press came along to ac-

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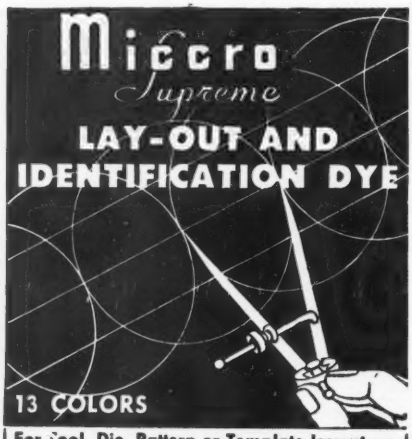
celerate enormously the communication of ideas between man and man these ideas multiplied and accumulated at an ever increasing pace. A direct result of the intellectual ferment which then grew up was, in the seventeenth century, the birth of modern science.

Now the birth of science had no immediate world-shaking effect on the development of technology. In the seventeenth and eighteenth centuries science concerned itself with the laws of falling bodies, the laws of the motion of the planets, some elementary laws of chemical combinations, and similar things of no great obvious practical importance to the farmer, the craftsman, or the warrior. Science was developing a new method of thinking and was developing new ideas about the structure and behavior of the physical world. Though the beginning of a contact between science and technology are discernible even in Galileo's work (his telescope, for example, was of immediate importance to the mariner) it was not until the middle or latter part of the nineteenth century that science and technology came together in a really big way. The results of this marriage have been truly revolutionary and it will pay us to examine the relationship with some care.

As a matter of fact, science and technology have become so intertwined with each other during the past few years that today we are in the rather curious position that many people, far from thinking of science and technology as two separate and distinct disciplines, are now inclined to regard the two as different forms of the same thing. Before we can understand the challenge of science and technology we must understand something of what science is and what technology is and in what respects they are alike and in what essential respects they differ.

First, what is science? It is easier



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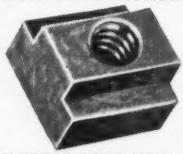

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to recite first some of the things that science is not. Science is not the development of new records of war. It is not the development of new or improved industrial products or processes. It is not even the discovery of new cures for human disease. Science is not the the development of any device or technique. Science is simply knowledge. The goal of scientific research is to discover new facts and principles concerning the behavior of the physical world. The eventual goal of science is to build a conceptual framework of the physical world, a system of theories, if you wish, on the basis of which one can understand and interpret natural phenomena and can also predict what events will occur under specified conditions.

This ability to understand and predict has during the past two centuries reached a high stage of perfection in certain areas of science. The laws of celestial mechanics are so exactly known that, for example, eclipses of the sun can be predicted with a high degree of precision for centuries to come. Quite adequate precision of prediction is also possible in great fields of mechanics, optics, electricity, and in certain fields of chemistry. However, as we enter the areas of more complex phenomena of organic chemistry and the biological sciences we find that we are only at the threshold of an understanding of the phenomena which take place here. The investigations of the past few years have shown pretty clearly that the first problem in these fields is the understanding of the nature and behavior

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of complex molecules. It is exciting to visualize what important progress can be made in this area in the coming years if suitable efforts are devoted to it. The basic techniques are now at hand so that an adequately extensive research effort may cause our knowledge to grow in snowball fashion.

But the point to be emphasized is that in all fields of basic science the goal of research is further understanding. The object is not to invent but to comprehend.

Now, of course, the goal of technology is very different. Each individual technological research project has as its aim the development of a specific device or technique which will be of practical use. In the days before the development of the scientific method technology proceeded largely by the trial and error method. The sum total of the achievements in the practical arts which are obtained by human beings over thousands of years of technological efforts are impressive, indeed. But the rate of progress during the past hundred years has been fantastically higher than that of any previous era to the extent, indeed, that in such fields as the development and use of power and in transportation and communication more progress has been made in fifty years than in all the previous thousands of years in human experience. It is the inter-action of science with technology which has made possible this accelerated rate of development. This inter-action is of two forms. In the first place, the discovery of new phenomena and new laws in the field of science has given rise to new practical applications. The abstruse theoretical studies of James Clerk Maxwell on the nature of light and of electricity led to Hertz' experiments which uncovered the existence of electromagnetic waves. These discoveries stimulated the brilliant Marconi to establish a whole new area of

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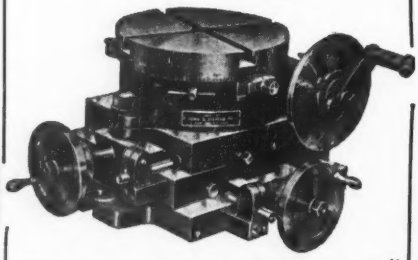

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technology which has given us among other things modern radio and television and radar.

The discovery of the laws of electromagnetic induction by Faraday eventually gave rise to the modern eletric power industry and all of its ramifications. The discovery of the basic laws of thermodynamics by Carnot, Joule, Kelvin, Helmholtz and others made possible the many modern forms of heat engine including the steam engine, the internal combustion engine and now the jet engine and the gas turbine. Pioneering work of a whole host of physicists and chemists who studied the nature of atoms and molecules made possible the creation of modern chemistry and the chemical industry. Dozens of other examples from other fields could, of course, be mentioned in which the discovery of a new law or new phenomena in science has made possible the creation of whole new areas of technology.

But technology has also grown by adopting in technological research the **methods** of science. Though the systematic trial and error method is still the mainstay of many areas of technology where the fundamental principles are still not fully understood, there are many other areas of technology where the method of the controlled experiment is not only possible but highly fruitful. The controlled experiment leads to an advance in theory which, in turn, leads to the prediction of the results of new experiments. Practically the whole of the technology of the electrical and radio industries, for example, proceeds in this fashion—the method of science which came out of the science laboratories of the nineteenth century.

In other words, science has contributed to technology not only new discoveries and a new understanding of nature upon the basis of which new practical devices and techniques can be based, but has also contributed a

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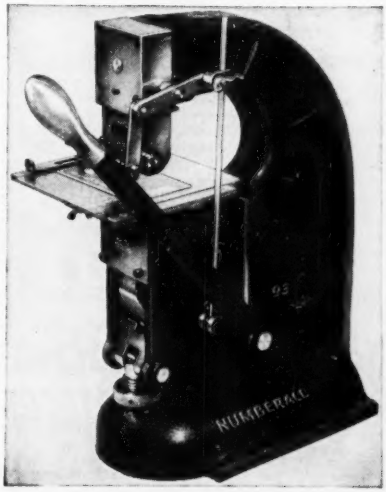

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new method of research which has multiplied the rate of technological advance by fantastic proportions.

Now the very fact that the research methods used in a laboratory of technology or of applied science are essentially identical with the methods used in a laboratory of pure science has led many people, including some very well known writers, to the conclusion that there is no real distinction between science and technology—between pure and applied science. This, it seems to me, is not only a very superficial view, but a very dangerous one. The implication of this view is that the burden of scientific research, though it was largely carried by the universities during the nineteenth century and the first quarter of the twentieth century, has now been largely assumed by the industrial laboratories, and more recently by government laboratories. All three kinds of laboratories, it is said, are working toward the same goal, and the great expansion in industrial and government laboratories means and will result in the great acceleration in the rate of growth of science. Even if the university laboratories should go out of business, some would conclude that science will continue to thrive in the laboratories of industry and government. There are even a few industrial leaders who have apparently subscribed to the thesis that what goes on in the university laboratories is of relatively small importance, in any case, for the only things of practical import will come from the industrial laboratories.

I think what I have already said is sufficient to suggest the dangerous aspect of this point of view. The laboratories of pure science in universities and the laboratories of applied science in industry do have much in common. But like the east—and west—bound sections of the streamliner, however identical they appear to be in their physi-

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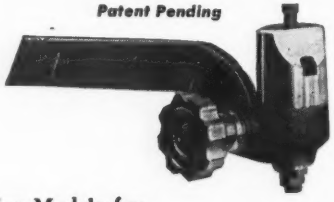

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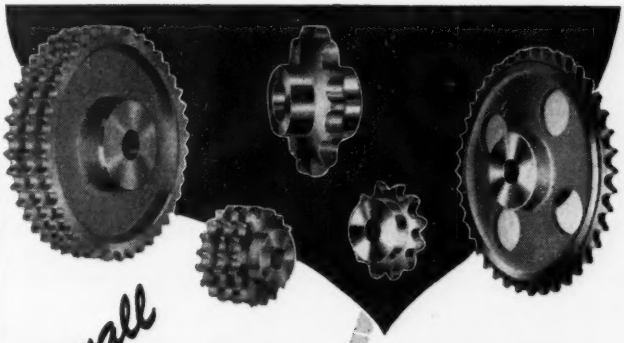
cal form, they are simply not headed in the same direction. The aim of science is to discover new knowledge and new principles. The aim of technology or applied science is to invent new devices, new machines, new processes, new techniques. And in the long run the new developments in technology will be based only upon the new knowledge uncovered by science. Only when totally new knowledge is discovered can a totally new technology arise. The technology of atomic energy, for example, was born not in the applied science laboratory of Los Alamos, New Mexico, but in the university laboratory of two German scientists who discovered the phenomena of nuclear fission in 1939. Their work, in turn, was based on the work in dozens of similar laboratories of nuclear physics located throughout the world and stemming from the basic discoveries of Lord Rutherford in Cambridge, England, the first man to split the nucleus of the atom back in 1918. A new technology cannot be erected in a vacuum. It must be based on a solid foundation of scientific discovery.

Now no one would argue, of course, that no important scientific discoveries have been made in industrial laboratories. Many of them carry forward basic research programs of great scientific value. The fact remains that a laboratory of applied science is not devoted primarily to the advancement of science, but is devoted to the advancement of technology and experience has shown that the great advances in basic science come primarily from the laboratories devoted wholly or primarily to this goal.

Now why do I go to such lengths



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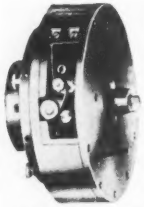
to emphasize this fairly obvious situation—and wherein lies the challenge to you, as industrial managers and to you as American citizens?

I emphasize this situation because I believe that we in this country are approaching a real crisis in regard to the future development of basic science. The American people seem to be so imbued with the idea that the chief products of science are such things as jet propelled planes, atomic bombs and television sets, that they have forgotten that all of these things rest upon basis scientific discoveries which were uncovered in research work which was not at all aimed at such practical results. The American people take such great pride in the fact that hundreds of millions of dollars of government and industrial money is going into research in applied science that they are unconcerned and even uninformed about the fact that but a tiny fraction of this amount is being fed into the laboratories of basic science wherein will be made the discoveries on which future technology will be based.

The dangers of spending all our funds and effort in applied science to the neglect of basic science can, I think, well be illustrated by a consideration of the field of medicine. Many people, I am sure, believe that the one and only way to find a cure for cancer is to build many large medical research centers where hundreds of doctors try out hundreds of thousands of chemical compounds on thousands of animals and human patients until some day the miraculous compound is discovered which will remove the scourge of cancer from the human race. Now I admit that there is a possibility that a cure for cancer will be found in this way. The trial and error method in applied science has led to many spectacular practical achievements. Nevertheless it would surely



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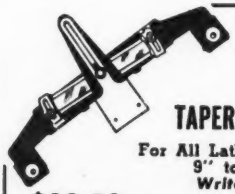

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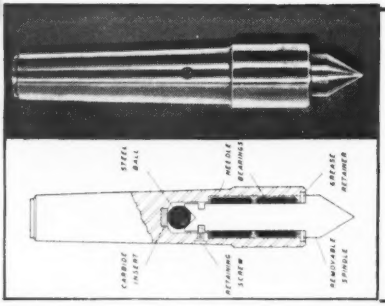

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seem to be good sense not to place all our bets in this direction. Rather we should give some support to those scientists who are trying to understand the basic processes that go on in the biological systems, the basic processes which give rise to the normal growth of cells and tissues, as well as to the abnormal growth which we call cancer. It is quite possible, in fact it is almost inevitable, that if we really understood the basic nature of cell growth, the conditions which give rise to abnormal would become evident and the methods of preventing such conditions might be immediately obvious. It is not impossible that the cause of cancer may lie in the fact that molecules of the wrong shape somehow get synthesized under certain conditions in the human body. Recent research by Dr. Pauling and his associates at the California Institute of Technology has shown conclusively that one human disease, known as sickle-cell anemia, is in fact a molecular disease. These workers have found that the hemoglobin molecules present in the red blood cells of patients suffering from sickle-cell anemia differ from normal hemoglobin molecules. Because of this difference in structure, molecules tend to clump into small crystals which, in turn, causes a change in shape in the red blood cells themselves in such a way that the blood no longer flows freely through the blood capillaries and lack of proper circulation results. It appears likely that this abnormal formation of hemoglobin molecules can be made normal again by some method of increasing the oxygen supply to the blood. At

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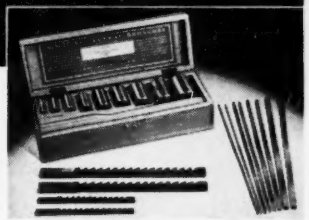

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least the development of a cure for this disease is now a straight-forward development program and the cure which eventually comes about would possibly not have been reached in a hundred years of trial and error experimentation.

What I am driving at is simply this. Great centers of medical research are fine, just as our great centers of research in other areas of applied science, such as the great industrial laboratories working on military technology. But the fuel which will eventually keep all of these laboratories going is the scientific knowledge which will come out of the laboratories of basic science. At the very least, for every hundred million dollars spent on medical technology, I wish that at least ten million dollars could be spent for basic scientific discoveries in biology, biochemistry, chemical biology and medical chemistry. I believe that one can say with confidence that out of the studies in this broad field of what is often called molecular biology will come the basic new knowledge on which better health for the human race can be built.

The challenge I am presenting to you therefore is a two-fold one. It can be briefly stated: Part one is the challenge to continue research in applied science to reap the maximum possible dividends in practical benefits from scientific discoveries already made. Part two is the continuance of high quality work in pure science which will lay the basis in new scientific discoveries of the new technology of tomorrow.

And what may we expect the science and technology of tomorrow to bring? What kinds of things dare we predict?

Prediction of the future is a highly uncertain business. But there are certain rules which can guide us even here. For example, we can safely predict that certain kinds of things will

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not develop—for they are contrary to well established physical laws. We can be pretty sure that the next 50 years will not bring into being a perpetual motion machine.. That sounds like a trivial statement to a scientist but there are many nonscientists who would be quite ready to predict that some day someone will find a trick for accomplishing the denial of the principal of conservation of energy. For example, a very well known economic analyst recently wrote at some length on the question of what a fine thing it will be when scientists invent a gravity screen. When such a screen has been found, he said, just think how fine it will be to cover stair steps with it so that walking up stairs will no longer require any effort. He didn't mention how one could possibly come down on such a staircase. However, a gravity screen—that is a sheet of material which cuts off gravitation forces—not only violates the law of gravity itself, but would make possible a perpetual motion machine of a kind which would give energy for nothing. This, therefore, is one future development we need not worry about.

Looking now to things which are not impossible and which might come to pass in the next 50 years we find that these fall into two classes. First, those which, while not impossible, have no basis for achievement with presently available scientific knowledge. When the scientific discoveries which might render them attainable will be made, if ever, it is of course impossible to forecast. For example, it is not impossible that we may some day be able to observe directly whether there is animal life on Mars. But the realization of this goal will require some wholly new discovery in the technique of observation—a discovery not yet in sight.

Similarly, the control of certain diseases, the extension of man's life span

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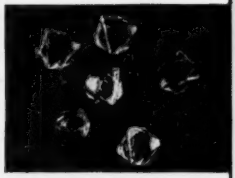

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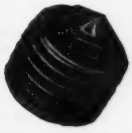

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to say, 150 years, the control of the weather, and many other things which we like to think about can come about only when and if totally new scientific discoveries are made; no one can say such discoveries will not be made—but no one can predict when they will come. Or, more likely, thousands of people will make such predictions and the one who happens to guess right will be hailed as a great prophet. Those who guess wrong will be dismissed as shortsighted men of no vision.

The second type of new developments which might be anticipated are those based on presently known scientific facts but which require practical inventive development to bring them into being or to render them practical and economical. The practical utilization of nuclear energy for the generation of electric power lies in this class. The basic scientific knowledge necessary for this is at hand. But how long it will be before a reliable and practical power plant is designed and built is still uncertain. Certainly experimental units will be operating within five years. Within another five or ten years the engineering problems standing in the way of building a large scale practical unit will have been solved. It is still uncertain, however, just how **cheap** atomic energy may be. I think it will be highly expensive for quite a long time. And I also think the serious dangers of the intense radiations for radioactive products will confine atomic furnaces to use only in remote locations. I will even go so far as to predict that in the year 2000 atomic energy will still be only in limited use for special purposes—and will not in the least have reduced the market for coal or oil or water power. But the special purposes for which atomic energy will be useful may be of the very greatest importance—and the very expensive engineering developments which will be required will even-

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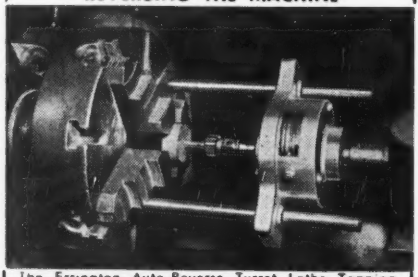

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tually pay off in favorable results.

But if present American industry does not need to fear the danger of a complete revolution based on atomic power, there are plenty of other possible technological developments which will result in very great changes. We can be perfectly sure that the art of communication will continue to advance at a dizzy pace. We have only begun to exploit the possibilities of rapid transmission of information by radio. Not only a news story or a picture or a television image can be transmitted but in principle one could transmit the contents of an entire book or newspaper in a few seconds. Long distance telephone cables may well go out of existence, and radio waves of wave lengths down to a few inches will come into use in hundreds of different ways.

Transportation will not stand still either. We could have passenger air transport from coast to coast in four hours now if we were willing to pay the cost. Two hours or less is certainly coming—maybe at rather high cost for most of us to use.

Industrial processes will also change rapidly. Automatic control technique can even eliminate great areas of routine tiring labor. The assembly line operated by a thousand men will give way to one operation by a hundred or ten or one. Maybe President Truman is right in predicting that soon the national production will reach a value of a thousand billion dollars a year. Technogically speaking, this is certainly not impossible. Whether the political and economic problems which stand in the way can be solved or not is a subject on which I shall offer no predictions whatever.

I could, of course, go on indefinitely offering guesses about new possibilities. But you are as able to do this at your leisure as I am. As long as you refrain from predicting things that

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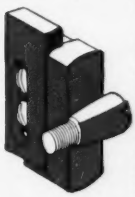

"B" A strong rigid serrated 2-bladed cutter—located in the bar with a taper pin. Bores holes accurately to close limits. Can be expanded and reground giving long life. Sizes ⅞" dia. up to 6".

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violate basic laws of physics or chemistry **some** of your predictions are bound to come true, provided only you make lots of them.

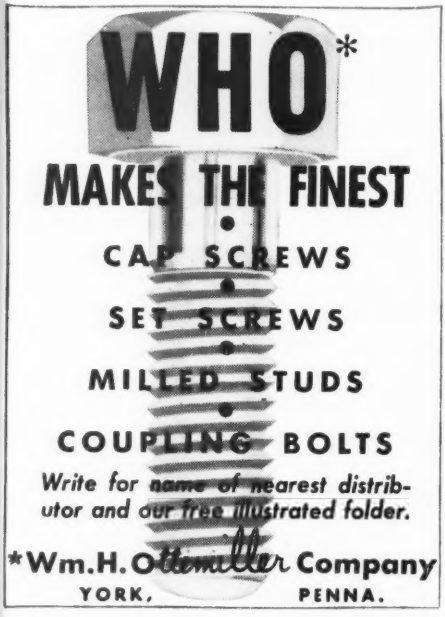
And so what? What is the challenge? What shall we do about it?

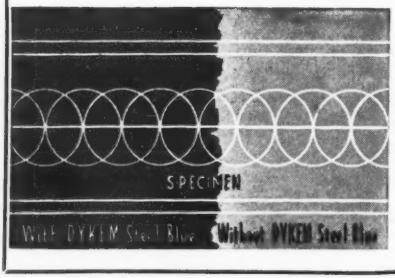
There are, of course, those who fear the future—who fear the further progress of science and technology. There have always been such people. A school board in Ohio a hundred years ago passed a rule that its school rooms should not be used for discussion of such wicked and impossible things as steam engines and railroads. Still earlier in England, a member of Parliament heatedly denounced the dangers of our growing knowledge and teaching of geography. It will be the ruination of the common people, he said. Another denounced research in anatomy, holding that the Lord had purposely covered up our insides and we would only get into trouble by penetrating His curtain of modesty.

We laugh at people who could be so blind—at people who feared knowledge rather than welcomed it. We scorn those who 50 years ago lacked the vision to foresee how science and technology would change the world—and who feared and fought against the changes as they came.

But are they entitled to laugh? Can anyone of us today foresee the world of 2000 A. D. or even 1951? Or do any two of us agree as to what we see? We are all short-sighted. And we will never know which of us sees or guesses the future the best until events have proved his words. The important thing is not that we foresee the future but that we do not fear it. We know there will be a change. The challenge is to welcome it—to encourage it—to make it a change for the better.

I will bring this discussion to a close by trying to sum up and make more definite the challenge about which I have been talking.





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The first challenge is this: science and technology will bring changes—so we must be ready to make the most of them. An industry which was frozen to the products and techniques of 1900 is not in existence in 1950. Or at least if it is it probably shouldn't be or probably won't last much longer. You can think of some industries perhaps that haven't had a new idea in 50 years but it isn't easy. On the other hand, the industry that is light on its feet and adapts itself quickly to new developments and indeed capitalizes on them is the one that best serves the public—and its stockholders.

But waiting for new developments to come along and hoping to use them—or not be destroyed by them—is not enough. And this brings us to challenge number two: the challenge to encourage and stimulate new developments by means of applied research. Inventive ingenuity, using the techniques of modern science and technology, have not even begun to exploit the possibilties of applying present scientific knowledge for the benefit of men. Increased productivity in industry and agriculture, new products and techniques in every industrial area, new advances in medicine leading immense forward strides in the conquest of disease—all of these will come—some slowly, some quickly. But they do not come automatically, or without effort or cost. But come they will because forward-looking men in industry will put forth the effort required.

I wonder if you realize that, aside from developments in military technology and in some phases of agriculture and public health which will be supported by government funds, practically the whole burden of applying scientific techniques for the improvement of the material well-being of men and women in this country lies on the shoulders of industry. It is from the industrial laboratories that new and better products and techniques will come. Someone else is not going to do

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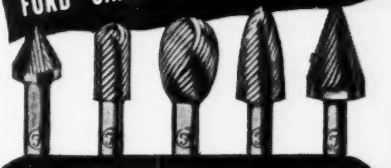

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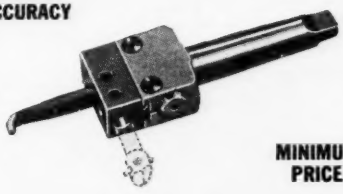

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that job. If it is done, you, the management of industry and of business will do it. It is a grave responsibility but an exciting challenge. But it is precisely the kind of challenge that American industry under the free enterprise system has always met. In fact, it is a challenge that can be fully met **only** in a system of private free enterprise. New and creative ideas in technology—ideas which must originate in the minds of men—do not come from men who are not free to think—and to think for themselves. No dictator can force men to have ideas. No system of regimentation of thought will nourish creative thinking. And regimentation is equally fatal, whether it be imposed by a national dictator, by a police state or even by a government bureau. By the same token, of course, it must not be imposed by industrial management either! If there is any area of human activity which flourishes only in an atmosphere of freedom, it is the area of creative science and technology. You will never find a real scientist advocating a dictatorship. You may find scientists with all sorts of other silly ideas (for they are just like other men) but not **that** one!

Freedom — private initiative —that is the first prerequisite for a virile technology. But there are other things that industry must provide or acquire to maintain technological progress. There are, in fact, four things: management, money, men, knowledge.

The intelligent management of research and an intelligent management policy toward research and toward the utilization of the products of re-

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search is a prime prerequisite. But far be it from me to tell America's leading managers how to manage.

Adequate funds for research are also necessary. But if the desirability and the necessity for industrial research are appreciated the money will somehow be found. Again, how it will be found you will know better than I.

But the last two ingredients of industrial research—men and knowledge—may not be so easy. We sometimes tend to take them for granted. But unless industry can draw on a supply of men carefully selected and adequately and soundly trained in creative research, no million dollar laboratories will be worth a cent in advancing technology. Research men are, of course, the products of the universities. The universities do the selecting and the training. It will be well for industry from time to time to take a look at our colleges and universities to make sure they are thriving—to make sure they are kept free. For without their products in trained minds not only technology but all of industry would soon wither and die.

And finally, knowledge. What knowledge is needed and whence does it come? The knowledge I am talking about is knowledge about the physical world—the knowledge of science. I refer not only to the knowledge we now possess which must flow continually into every industrial laboratory but also new knowledge which is yet to come—new knowledge which is essential to a new technology. In other words, a strong technology—as I have already frequently said—depends upon a strong science.

And this brings me to the third challenge which I offer you—a challenge which has not previously existed or one of which industry has been unconscious. This is the challenge to insure the future of science. Industry has always in the past taken basic science for granted. It has always assumed

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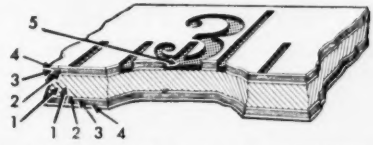

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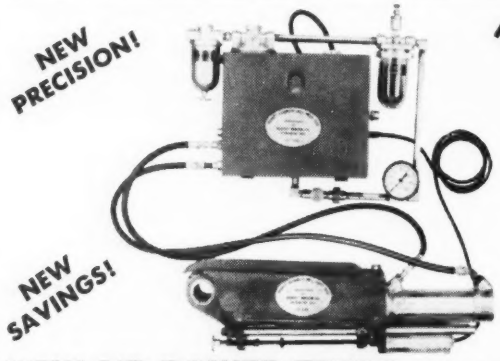
that somehow, somewhere the new scientific discoveries on which the new technology of tomorrow would be built would be made. And where have they been made? With a few important exceptions they have come from the laboratories of the world's universities. And until a few years ago the most active university laboratories were in Europe.

And what of the sciences of the future? The responsibility clearly rests heavily on the universities of America. Can they meet this responsibility? Under the American system this depends upon the people of America. If the people, through taxes paid for the support of state universities and gifts to the private ones, continue to support the universities they will continue to thrive. But since industry as we have seen is a great benefactor of the products of the universities, namely, men and knowledge, industry too faces the challenge to insure their continued virility. Just how this will be done is not yet clear. It is a new situation—a new problem—and an adequate solution has not been found. That is the challenge which I leave with you.

But we can be sure of one thing that if the challenges I have presented are met—the challenges to support science, to encourage technology and to make use of their products — then no prediction about the future material welfare of this country is rosy enough to live up to the actual facts as they are certain to develop. A surprising share of the responsibility for the future rests in your hands. And I for one am not worried.



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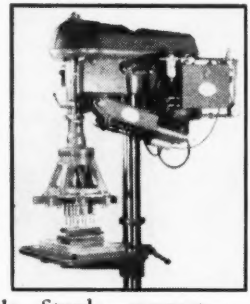

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Book Reviews

Motion and Time Study. Third Edition. By Ralph M. Barnes. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 559 pages, 6 x 9¼ inches. 345 illustrations. Cloth binding, board covers. Price, $5.00.

A guide to the successful application of motion and time study methods, this volume incorporates the findings of the the author in making a survey of 80 factories to determine the most successful motion and time study techniques. The entire book has been revised and five new chapters have been added dealing with process analysis, gang process charts, activity charts, and man and machine charts. New appendixes tell how to set up a work methods training program. Also featured in the book is a chapter presenting a general discussion of motion and time study rating programs, as well as an appendix containing a time study manual which is actually being used by one company to teach time study procedures to foremen and supervisors.

"Developments in Social Security and Workmen's Compensation (Insurance Series No. 81). Published by American Management Association, 330 W. 42nd St., New York 18, N. Y. 43 pages. Paper covers. Price, $1.00.

Included in this booklet are papers on the "Practical Implications of Social security Legislation" covering state disability legislation, federal social security, their effects on labor relations, and the methods of evaluating company insurance programs. Authors include George Rogers, insurance manager, Robert Gair Company, New York; Richard E. Chislett II, Standard Oil Company of New Jersey, New York; E. M. Cushing, director of industrial relations, U. S. Rubber Company, New York; William Leslie, general manager, National Bureau of Casualty Underwriters, New York; Eugene Dougherty, insurance manager, Anheuser-Busch, Inc., St. Louis; and Winston S. Fliess, group and pensions department, Johnson & Higgins, New York.

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Synthetic Rubber Packings. Third Edition. Prepared by Hydraulic Engineering Department, E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa. 110 pages. Illustrated cloth binding, flexible covers.

Intended as a reference work for design engineers and maintenance men, this handbook has been completely revised so as to bring data on the proper application and use of synthetic packings up to date. The book includes packing standardization advocated by Houghton and as approved by the Joint Industry Conference last year. Types of packings covered include fabricated V-packings, fabricated cup packings, fabricated U-packings, fabricated flange packings, homogeneous V-packings, homogeneous U-cups, O-ring packings, O-ring gaskets, homogeneous cups and flanges, leather back-up washers, and so on.

Labor Relations and Political Action—The Challenge to Management (General Management Series No. 143). Published by American Management Association, 330 W. 42nd St., New York 18, N. Y. 24 pages. Paper covers. Price, 50 cents.

This booklet includes a paper by Cyrus S. Ching, director of the Federal Mediation and Conciliation Service, on "The Future of Labor-Management Relations"; an article by Edward T. Cheyfitz, former member of CIO's National Executive Board and assistant to the president of the Motion Picture Association of America, on "The Implications to Management of Labor's Political Action"; and a paper by J. Douglas Brown, director, industrial relations section, Princeton University, on "Management's Stake in the Survival of Contributory Social Insurance".

The Fatigue Allowance in Industrial Time Study. Written and published by Matthew A. Payne, 13777 Euclid Ave., East Cleveland 12, Ohio. 66 pages. 65 quotations. 85 references. Heavy paper covers. Price, $2.50.

Recommended for industrial engineers, time study engineers, industrial relations men, union officials, workload arbitrators, and plant supervisors, this booklet presents and describes problems associated with the purpose, determination, and application of the fatigue allowance in industrial time study. It contains many industrial engineering opinions concerning the fatigue allowance and its affect upon workloads, fair day's work, manpower, and incentive assignments.

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THE OK TOOL COMPANY

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Welfare Issues in Collective Bargaining (Personal Series No. 131). Published by American Management Association, 330 W. 42nd St., New York 18, N. Y. 40 pages. Paper covers. Price, $1.00.

This booklet includes papers on pensions and other issues of collective bargaining by Merlyn S. Pitzele, labor editor, "Business Week," New York; Abner Brodie, University of Wisconsin Law School; E. H. van Delden, director of industrial relations, Libby-Owens-Ford Glass Company, Toledo; Harry Kranz, legislative director, New Jersey State CIO Council, Newark; and Burton A. Zorn, Proskauer, Rose, Goetz and Mendelsohn, New York. A special section of the booklet is devoted to handling lay-off problems and is a transcript of a panel discussion at a recent AMA conference of personnel by L. Clayton Hill, professor of industrial relations, University of Michigan; Solomon Barkin, research director, Textile Workers Union of America (CIO), New York; C. G. Frantz, president, Apex Electrical Manufacturing Company, Cleveland; Charles D. Stewart, assistant commissioner, Bureau of Labor Statistics, Department of Labor; and J. R. Miller, regional personnel manager, General Foods Corporation, New York.

Electric Arc Welding — Procedure and Practice. Published by Hobart Trade School, Inc., Box EW-146, Troy, Ohio. 544 pages, illustrated. Cloth binding, Flexible covers. Price $3.00.

This volume is described as a comprehensive and practical textbook on the procedure and practice of arc welding which is of outstanding value not only for the student but also for the practicing welding engineer, welding operator and designer, as well as for executives and supervisors interested in welding procedure and practice. Clearly written and illustrated with over 600 photographs of operations, diagrams, and charts, the book includes 28 chapters which are divided into five parts as follows: (1) General Information; (2) Operator Training Course; (3) Carbon Arc Welding and Cutting; (4) Other Welding Processes; and (5) Welding Terms and definitions.

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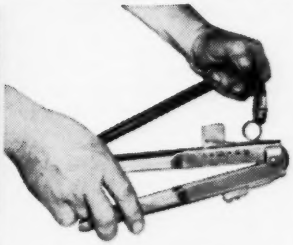
Fastest machine known for contracting hose ferrules. Air-powered; foot control. Does thousands of connections per day *effortlessly*. Full range of die sizes available. Write for complete catalog data sheet.



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Works on new principle. Delivers terrific pressure with easy squeeze. Adjustable quickly for various sizes of ferrules. So inexpensive every maintenance man can carry one. 9½" long. Weighs only 10 oz. Write for complete catalog data sheet.

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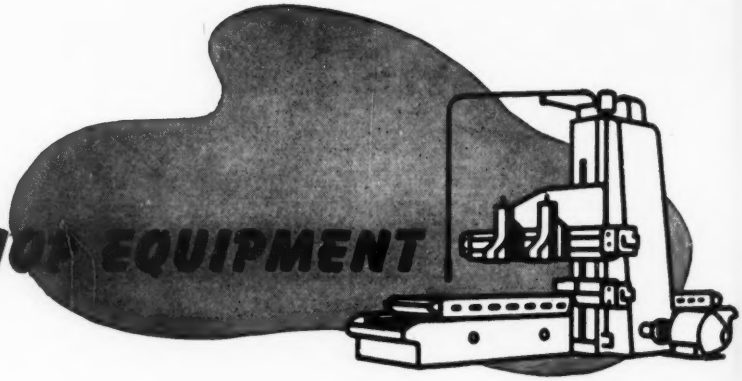


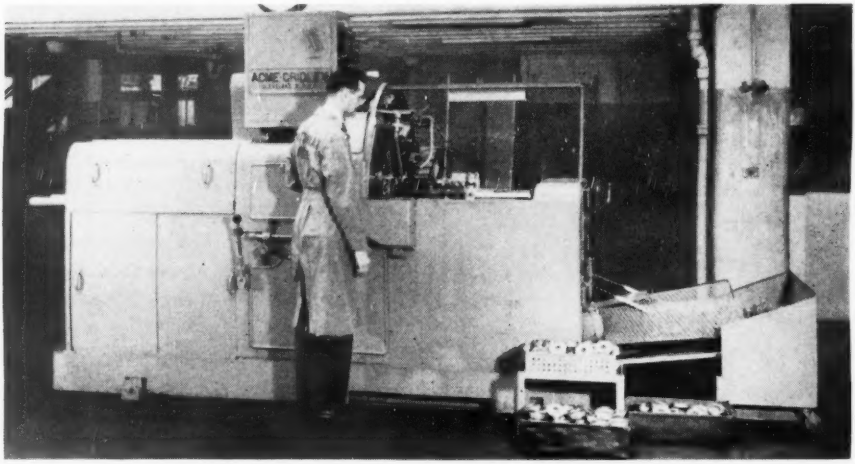
NEW SHOP EQUIPMENT

Single Spindle Automatic Bar Machine

Rounding out its line of automatics, the National Acme Co., 170 E. 131st St., Cleveland 8, Ohio, has announced the Acme-Gridley Model M Single Spindle Automatic Bar Machine which is particularly adapted to carbide tooling and is available in sizes of 2⅝, 3½, 4¾, and 5½ inches.

The sturdy frame is of box shape design, well supported and built up to accommodate the strains from cross slides, spindle drive, and turret. The pan is a rigid, double-wall structure supporting the headstock, outer support for the turret, and stock fed mechanism in the rear. Rigid support for the turret is provided in the headstock and by the outer support which is connected to the headstock by a triangular housing on the rear side of the machine. In the large, open tooling zone, two lower cross slides of the Acme-Gridley angular mounting type provide facilities for heavy forming operations, while a third slide is provided for cutoff. The indexing turret has five slides for end working and stock stop. Threading can be performed with self-opening dies for collapsible taps.

The machine in general is very accessible, and its open type tooling zone provides for ease of operation and setup from both sides. The turret is indexed with an



Acme-Gridley Model M Single Spindle Automatic Bar Machine with Chip Conveyor

GET THE "HOLE" STORY WITH Starrett ACCURACY

STARRETT Offers The Widest Choice of Precision Tools for Accurate Inside Measurement. For complete information, see your Starrett Distributor or write for FREE Starrett Catalog No. 26 "MD"

SMALL HOLE GAGES NO. 829

For fast, accurate small hole gaging — supplements No. 229 Telescoping Gages. Four gages in handy red leather case. Range, ⅛ to ½ inch. Quick adjustment and sensitive contact makes it easy to feel small dimensions accurately and transfer to a micrometer.

NO. 830 HOLE GAGES (SHORT TYPE)

Especially adapted for work in close quarters, shallow holes and slots, between work and machine spindle, etc. Note shorter length and special shaped contact. Total capacity, set of five gages, in convenient red plastic case ⅛ to ½ inch.

TELESCOPING GAGES NO. 229

Made to measure holes from ½ to 6 inches — shrink, close or loose fits. Ideal for transferring internal measurements to micrometer or outside caliper. Plunger locked or released by knurled screw. Set consists of five gages.

INSIDE MICROMETER CALIPER NO. 823 With No Glare Satin Chrome Finish

Both this caliper and the No. 124 below offer a choice of two excellent tools. No. 823 is a popular model preferred by some mechanics for its larger diameter rods and anvils. Rods are centerless ground steel tubes light-weight yet rigid for nice balance and feel. Each rod marked for length and adjustable for accuracy. Micrometer head has ½" movement with a thousandth lines numbered. Patented handle furnished provides correct reach and balance. Set A, 1½-8". Set B, 1½-12".

INSIDE MICROMETER CALIPER NO. 124 With No Glare Satin Chrome Finish

An old favorite with mechanics and machinists for internal and linear precision measurements and for setting calipers, comparing gages, etc. Set includes a micrometer head with ½" movement, solid extension rods, spacing gage, auxiliary handle and spanner wrench. Capacities: Set A (shown), 2-8 inches; Set B, 2-12 inches; Set C, 8-32 inches, Set D, 2-32 inches.

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independent motor by a Geneva movement located in the outer support. The lock bolt disc and lock bolt are also located in this housing, which is entirely independent from the toolslide and other machine movements, all of which are controlled by the main drive motor located on top of the machine. With this independent controlled indexing mechanism, it is possible to index the turret toolslides one or more positions as may be required by the setup.

Spindle speed change gears and three automatically controlled range gears provide a wide spindle speed range. Spindle drive is from the pulley shaft through change gears to a jackshaft and then to a clutch shaft where three clutch-controlled range gears provide as many as three different spindle speeds without changing the spindle change gears. Automatic control of the range gear clutches is effected from the main camshaft.

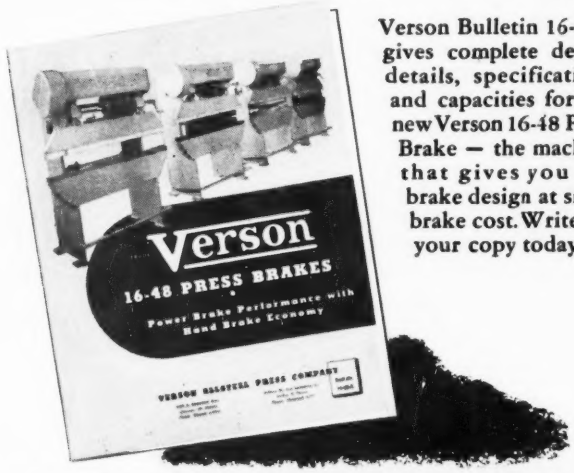
Feed control for the main camshaft is by direct drive from the main spindle so that the toolslide feed will always be in proper relation to the work spindle. With a few steel cams of different cam angles and the flexibility of the feed change gears, the standard range of toolslide feed per spindle r.p.m. is from 0.0040 to 0.0444 inch. The machine can be easily arranged to provide a coarse and fine feed range in addition to the standard one, using the same cams and feed change gears. Feed change gears and spindle speed change gears are interchangeable.

Idle time movements, such as chuck opening and closing, stock feeding, return of the toolslides, and other machine movements operated by the main drive motor but not directly connected with the feed control are effected by the constant speed shaft driven directly from the pulley shaft and independent of the spindle speed or feed. This fast speed is automatically controlled or may be engaged by a separate hand lever for use in setting up the machine. The low speed or feed control is by a hand lever conveniently located on the front side of the machine.

The cross slides or forming slides

Here's your guide

to lower metal forming costs on smaller jobs



Verson Bulletin 16-48A gives complete design details, specifications and capacities for the new Verson 16-48 Press Brake — the machine that gives you big brake design at small brake cost. Write for your copy today!

VERSON ALLSTEEL PRESS CO.

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Holmes St. and Ledbetter Dr.
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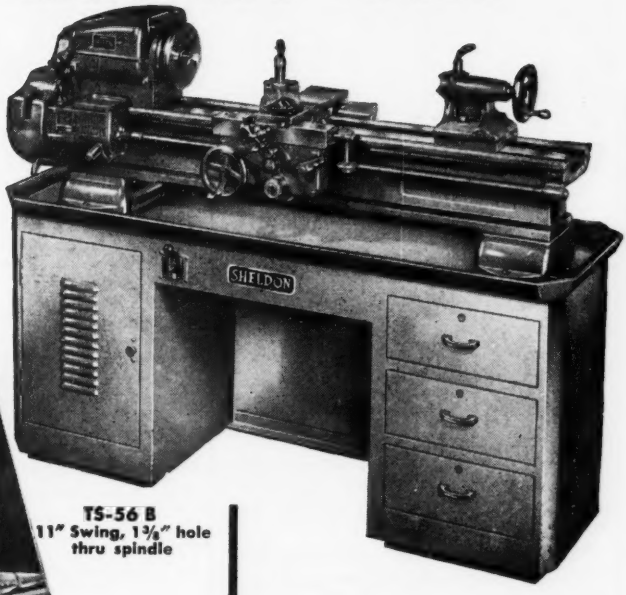
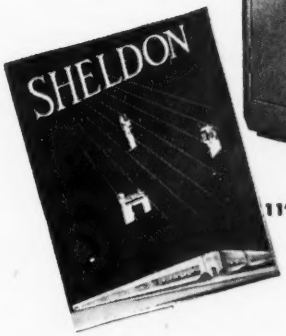
THERE'S A VERSON PRESS BRAKE FOR EVERY JOB FROM 15 TONS UP!

66 *variations* of 5 modern machine tools





TS-56 B
11" Swing, 1⅜" hole thru spindle

Here is a Catalog every buyer of Machine Tools should have for it shows, describes and gives specifications of today's most advanced line of moderate priced precision machine tools.

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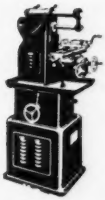
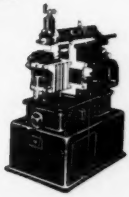
These tools will be demonstrated in Booth No. 430 at the ASTE Show in Philadelphia, April 10-14.



Horizontal Milling Machine



12" Back Geared Shaper

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Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

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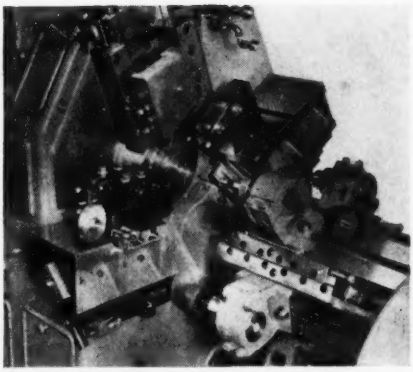
are independently operated by steel cams located directly underneath the slides, while a third cam set provides independent operation of the cutoff slide. Each of the turret slides is also independently controlled by steel cams located on a cam drum in the headstock section. Thus, with independent control of each of the three side-working toolslides and with a few cams of different cam angles for the turret slides, all slide movements can be cammed independently and synchronized with each other, varying the length of travel of the turret slides as required and providing the correct feed per spindle rev-



Close-Up View Showing Tooling of Acme-Gridley Model M Single Spindle Automatic Bar Machine

olution independently on each slide.

Stock feed is of the spring feed type, controlled by guide bars for the feed tube and yoke; and the stock is advanced by means of two springs. Backward movement of the feed mechanism is cam controlled and may be varied up to 10-inch feed lengths standard; longer feeds are obtainable as special.

The main drive motor is a standard 60-cycle a.c. 1,800 r.p.m. unit (50-cycle 1,450 r.p.m. for export machines). A d.c. motor can be supplied to user specifications.

Synchronized Concentric Lathe and Drill

Product of Auto-Tool & Engineering Co., 2906 W. Armitage Ave., Chicago 47, Ill., the synchronized concentric lathe and Auto-Drill shown herewith is said to

Why THOR STAMPS Last Longer

. . . because they're made of a special, correctly-heated alloy steel. Central striking point assures uniform marking. Thumb side marking assures easy use.

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for Model Kitchens!

Six versatile De-Sta-Co Toggle Clamps save in this simple, economical, plastics cementing fixture. The turntable more than *doubles* production . . . eliminates the cementing cycle "bottleneck."

These perfect reproductions are for a manufacturer of metal kitchens. This operation, cementing on tops, requires: Fast cementing cycle—positive clamping pressure for a perfect bond—precise alignment for accurate assembly.

De-Sta-Co No. 225-U fills these requirements. *Completely retractable* when opened for quick insertion and removal of work, it offers the rapid toggle action, positive holding pressure and accurate performance that make De-Sta-Co Toggle Clamps *ideal* "Model Tooling".

For *your* working-holding problems in Assembly, Welding, Bonding, Machining, Inspection . . . of any materials . . . tool up with these economical, efficient, high-production examples of "Model Tooling".

De-Sta-Co Toggle Clamp Catalog describes more than forty stationary and portable clamps. Write for your free copy today.

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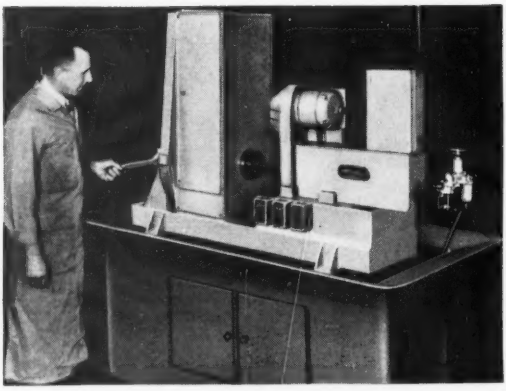


Synchronized Concentric Lathe and Auto-Drill

make possible the drilling of round piece parts accurately concentric to 0.001 to 0.004 inch. The machine consists of a stand with built-in coolant tank and pump, a machine bed, a variable speed lathe head (with speeds from 200 to 3,000 r.p.m.), and an Auto-Drill unit with peck and drill attachment, incorporating rotary and reciprocal motions and adjustable as to speed, depth, pressure, and dwell.

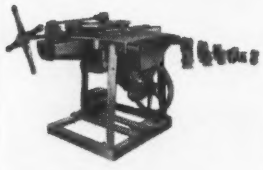
Auto-Drill speed range (for the "A" unit) is 850 to 5,000 r.p.m., with stroke length of 4 inches and pressure up to 500 lb. with 100 lb. of air. For the "B" unit, there is a speed range of 375 to 3,000 r.p.m. with pressure up to 1,000 lb. with 100 lb. of air. Peck motion can be metered down to ⅛-inch peck per motion and dwell regulated from ½ second up.

The synchronized concentric lathe and Auto-Drill is semi-special and made with two lathe head sizes. It is extremely maneuverable and variations are possible to adapt the machine to individual requirements. Many additional accessories are also available.

Sheet Metal Fabricator

The Wales Fabricator introduced by the Wales-Strippit Corp., 345 Payne Ave., N. Tonawanda, N. Y., is designed to punch,

Hand-Powered "American" A-30



Motor-Powered "American" 2PB

bend pipe by hand or power with "American"

cold pipe, conduit and heavy wall tube BENDING MACHINES

Fast... Simple... Dependable...

RADIANT HEAT BENDS in Standard Pipe

Fast . . . Accurate . . . Average bend takes only 60 seconds! Up to 180° bends . . . all sizes from ½" to 2". Usual radiant heat bends for 1¼" at 6" and 9" radii can be supplied. Only 7 parts. Occupies 18" x 18" floor space.

Capacity ½" to 2" standard pipe . . . Minimum radius 5 times pipe diameter up to 180° . . . Maximum radius 13". Complete with rolls for each size pipe. Standard motor equipment 2 h.p.

Special radii supplied on request.

"American" PIPE BENDING MACHINE Company INC

Factory and Main Offices: 14 Furnace St., Poultney, Vt.

notch, and nibble mild steel up to ¼ inch thick. The unit includes a "quick-change" holder for the rapid changing of punches and dies for various round and shaped hole diameters.

The Wales Fabricator is specially designed to permit the use of standard Wales Type "BL" hole punching units and Type "NA" notching units. Wales press bed filler plates are interchangeable with the quick-change holder to permit the use of standard Wales units.

The machine features a Hydra-New-Matic head which is said to operate with a minimum of vibration and noise at 16[illegible] strokes a minute for single hole punching

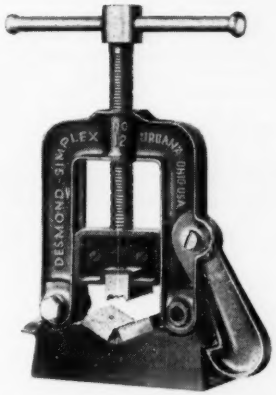
Wales Fabricator

and nibbling. The machine also includes a 14-drawer cabinet for holding punch assemblies and dies for the quick-change holder. The one-piece steel casting frame of the unit is designed to provide maximum rigidity. A single clearance tube hole in the lower left side of the press directs slugs to out-of-the-way containers. Dual control of the ram strokes is provided by an adjustable foot trip mechanism for use when both hands are required to feed work or when large sheets make it awkward to use the hand trip lever.

Air Press

Bieber & Dresback, Dept. MS, 616 Riverside Ave., Saugatuck (Westport), Conn., has announced the Model No. 20

NEW HINGED PIPE VISE



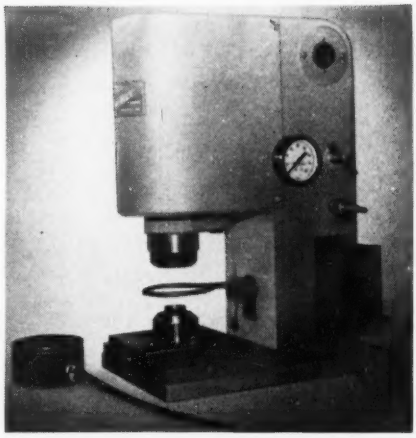
with the typical Desmond extra values

New type pipe jaws with long contact faces, machined from tool steel, oil tempered to assure long service . . . self-locking jaw hook . . . rugged frame cast of high-grade malleable iron . . . main screw and handle of high tensile strength steel . . . accurately machined . . . four sizes to hold ⅛" to 4½" OD pipe . . . these are the plus values you can expect in *any* vise that bears the name "Desmond-Simplex." Whatever type of vise you need, specify Desmond-Simplex. Order from your industrial distributor . . . The Desmond-Stephan Mfg. Co., Urbana, Ohio.

Desmond SIMPLEX VISES

you get more value you pay no more

"Air Act" Press illustrated herewith, which is designed to deliver an impact blow of approximately 3½ tons at 80 lb. air pressure. The operating mechanism of the machine embodies a positive non-repeat arrangement whereby the operator must remove his foot from the foot treadle before the press is ready to make another cycle. The non-repeat device can be arranged to operate on a continuous cycle if desired. Also embodied in the operating mechanism is a safety guard arrangement which exerts less than 1 lb. pressure on the hand of the operator so that if by chance the operator's hand is over the tooling, the press cannot be tripped.



Bieber & Dresback No. 2 "Air Act" Press

The ram of the press is adjustable to provide a stroke of from 2 to 3 inches; however, a greater stroke adjustment can be furnished if desired. The ram pressure may be varied and is said to be easily adjustable to provide either a positive or negative blow action. The positive blow action is used for applications that require a fast, sharp, hammer-like blow such as in trimming the flash from molded parts and die castings, coining or embossing small metal parts, and riveting and assembly work. The negative blow is used for applications that require a squeeze action such as in performing light metal stamping operations, metal forming jobs, and lay-over operations in assembly work.

An automatic dial feed or roll feed can be easily adapted to the machine. The

DUAL CROSS and ROTARY FEED

PALMGREN **Rotary, Index MILLING TABLE**

No. 83 Only $49.50

Has 8" table, 360° movement and 4" cross feed travel. Adjusting wheels and dials graduated in degrees and thousandths. Slotted for bolting to table. No. 82 without rotary feed $39.75. *Write for Circular No. 10.*

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Slip Spindles
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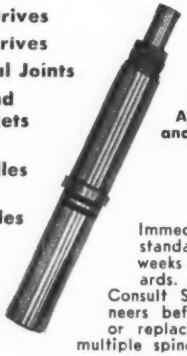

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TO FIT ALL MAKES OF PUNCH MACHINES

Large range of round, square, flat, and oval sizes are carriec in stock for immediate shipment. Special Tools Made To Order.

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T. H. Lewthwaite Mach. Co.
317 East 47th St., New York 17

speed of the ram can be controlled in either or both directions so that the downward stroke can be slow or fast with a fast return on the upstroke or vice versa. In addition to the 3½-ton model shown, the press can also be obtained in other capacities.

Skin Cream

Tarbonis Cream for combating the many forms of occupational skin irritations is now being marketed by The Tarbonis Co., 4300 Euclid Ave., Cleveland 3, Ohio. The cream is recommended for skin irritation due to cutting oils, coolants, abrasives, solvents, acids, alkalies, chemicals, and so on.

Tarbonis includes a vanishing cream vehicle which is rubbed into the pores of the skin and is said to quickly alleviate the discomfort of irritations. Neat and clean, the cream can be applied to the hands while on the job without interference with the employee's work.

Drill Press Attachment

Known as the "Torkarm," a drill press attachment which is claimed to provide for maximum safety in performing drilling and tapping operations has been placed on the market by the Torkarm Corp., 2908 S. Emerson Ave., Minneapolis 8, Minn. Designed for clamping onto a drill press of any size and operating on same principle as a pantagraph-type drafting machine, the attachment is said to hold work firmly yet permit the operator to move it freely across the work table.

According to the manufacturer, the Torkarm converts the torque of a spinning drill, tap or reamer into a useful force which aids in holding work in place. A series of cam-locking and hold-down work plates is available which enables practically any shape or size piece to be quickly drilled, tapped, or reamed regardless of the horsepower applied. The free movement torque absorption attained by

Saving taps... cutting costs...
for over 30 years!
Exclusive Procunier "Tru-Grip" Tap Saver
Small size for easier tapping close to walls or shoulders. Lighter, smaller in diameter, it does more accurate, high speed tapping.

PROCUNIER HIGH SPEED TAP HEADS

have been keeping production costs down — doing fast, precision tapping with fewer broken taps . . . for more than 30 years! Today, *improved* Procunier tap heads have more features than ever before, including the sensitive, friction clutch; heat treated gear mechanism for long, trouble-free mechanical life; ball bearings for lifetime accuracy; a simple, one-hole lubrication system . . . as well as many others.

Investigate PROCUNIER — the tapping heads that have set the standards for over 30 years. WRITE TODAY for illustrated brochure giving complete details, specifications and prices.

PROCUNIER SAFETY CHUCK CO.
12 S. Clinton, Chicago 6, Ill.

Gentlemen: Please send full details about improved Procunier high speed tapping equipment.

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Address _____

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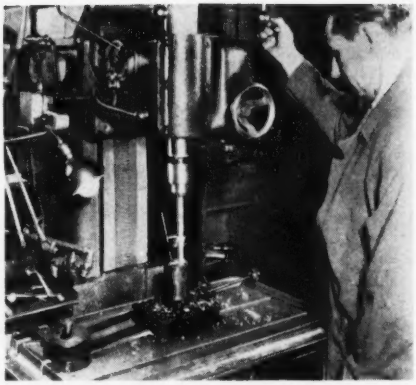
the Torkarm is said to be due to the action of two pairs of arms hinged in parallel on fixed centers at both ends and in the middle. The hinging allows free lateral movement, while the fixed center arrangement forces the arms to remain parallel which, in turn, assures their remaining equal in length regardless of any position they may assume. Since each set of arms is fastened and hinged individually at one end of the table and at the other to a "free" work plate, the plate cannot rotate, it is claimed. Thus, the plate is said to remain stationary under torque but is permitted to move freely across the horizontal plane of the table in any direction when lateral force is applied.

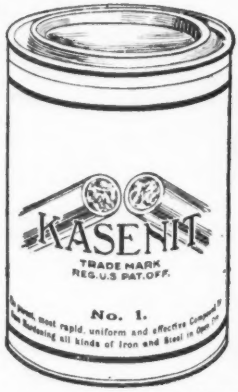


"Torkarm" Drill Press Attachment in Use

Vertical Automatic Production Lathe

A vertical automatic production lathe designed to efficiently utilize high speed negative-rake cutting tools in performing turning, boring, and facing operations has been developed by the Reed-Prentice Corp., Dept. V-27, Worcester 4, Mass. The lathe is controlled on a central cycle timer which, after the work has been chucked, starts the spindle, starts each slide to move at its appointed time, and, when the last tool has completed its work, stops the spindle.

The slides of the machine are independent of each other and may be set to operate through their motions at any time during a machine cycle. Feed boxes for



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ONE POUND CAN: $1.44 Plus Postage
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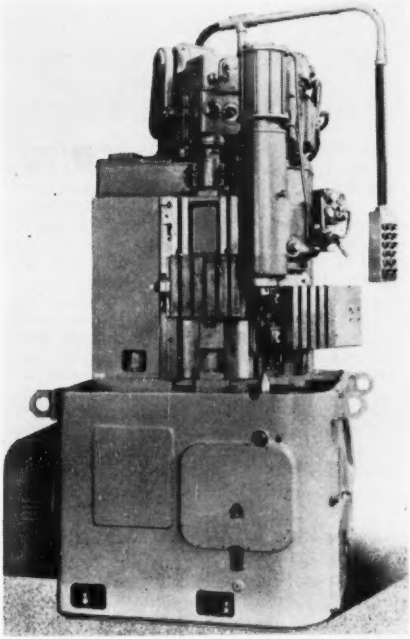
NEW YORK 14, N. Y.

STOP Oily Floor Mishaps with FULLER'S EARTH

Avoid costly accidents caused by slipping on oily or greasy floors! Reduce fire hazards! Replace sawdust or wood shavings with Fuller's Earth. Every shop needs this low-priced safety aid. Fuller's Earth *absorbs* oil and grease — and it's non-inflammable. Write for FREE SAMPLE to test.

TAMMS Dept. RM-9, TAMMS INDUSTRIES, Inc., 228 N. La Salle Street, Chicago 1

each slide are identical and each is equipped with a motor, hydraulic system for shifting the clutches, and solenoid-operated valves. The feed boxes permit the traversing of tools to cutting position, feed, stop, dwell, return, and then stop for removal of the workpiece. For setting up the machine, all movements may be controlled by push buttons conveniently located in a pendant panel. A selector switch is used to select the slide to be

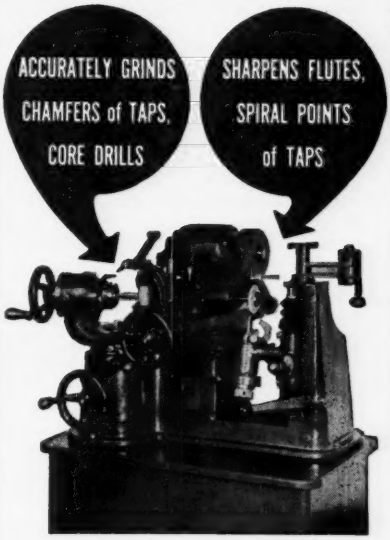


Reed-Prentice Vertical Automatic Production Lathe

moved after which, by means of the plainly marked push button, the slide may be moved at feed rate or rapid traverse work performed as a final check on correct tool setups.

The standard machine is 70 inches long x 65½ inches wide x 113 inches high and is equipped with one turning slide, one facing slide (arranged to swivel), and a tailstock which may be replaced with a boring head when needed. The lathe is designed to permit the addition of an extra slide and may be supplied with attachments for taper turning or forming and for other types of work.

THE *New* MODEL 1100 HYBCO TAP GRINDER



- **Capacities No. 2 Mach. Screw to 1½" Hand Taps.**
- **All Settings Adjustable To Give Any Angle—Relief—Hook.**
- **Taps Held In Precision Collets Can Be Sharpened After Center Is Destroyed.**
- **Standard Motor—Any Current Specification.**

VISIT BOOTH 401
A.S.T.E. Industrial Cost-Cutting Exposition at Philadelphia

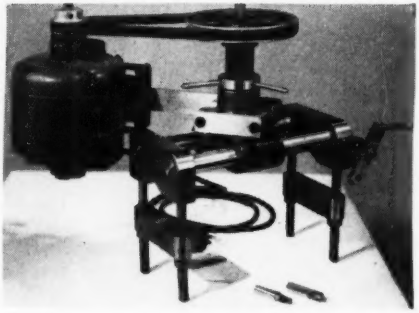
Representatives In Principal Cities

Henry P. Boggis & Co.
708 East 163rd Street
Cleveland 10, Ohio

Portable Milling Machine

Known as the "Keymil," a portable milling machine for cutting keyways quickly and accurately in shafts from $\frac{5}{8}$ to $3\frac{1}{2}$ inches in diameter has been placed on the market by the Keymil Mfg. Co., R. D. 3, Mechanicsburg, Pa. Keyways from $\frac{1}{8}$ to $\frac{3}{4}$ inch wide, from $\frac{1}{16}$ to $\frac{1}{2}$ inch deep, and up to 6 inches long can be produced with the machine.

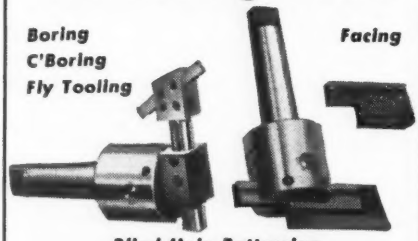
Self-aligning, the Keymil may be driven with a motor, drill press, electric or pneumatic drill of moderate speed. Keyways may be cut on shafts in place provided the minimum clearance (exposed length) of shaft between pulleys, gears and/or couplings is 12 inches. The Keymil may be operated horizontally, vertically, or upside down and, in all cases, is claimed to cut keyways with sides and bottom parallel with the axis of the shaft and exactly central. Ruggedly built for intermittent or continuous service, the Keymil can be furnished with a motor and bracket as a self-containd powered machine tool and, for manufacturing purposes, can be mounted with motor and bracket on a pedestal or stand with friction swivel which will enable the unit to adjust itself to heavy or long shafts without blocking up the far end.



Motor Driven "Keymil"

Cut Boring Costs

Boring
C'Boring
Fly Tooling



Facing

Blind Hole Bottoming

Many enthusiastic users report that the Behr Boring Bar actually pays for itself in the first four weeks of operation. Just ask the man who uses one

This proven, patented bar is chatter proof, extremely accurate and ultra efficient. Has interchangeable blades and accessories.

It is unequalled for versatility and efficiency.

BEPCO

Can you afford not to get the facts?

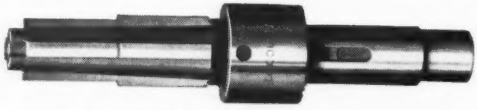
WRITE FOR CATALOG TODAY

BEHR PRODUCTS COMPANY
WARREN, MICHIGAN

Extra Long Bed Lathe

American Steel Foundries, King Machine Tool Division, Cincinnati 29, Ohio, is now producing its Sebastian 20-inch Geared Head Lathe in extra long bed lengths up to 20 feet. Available in both general purpose and gap types, the lathe is designed to handle a wide range of

LE COUNT'S
EXPANDING MANDRELS

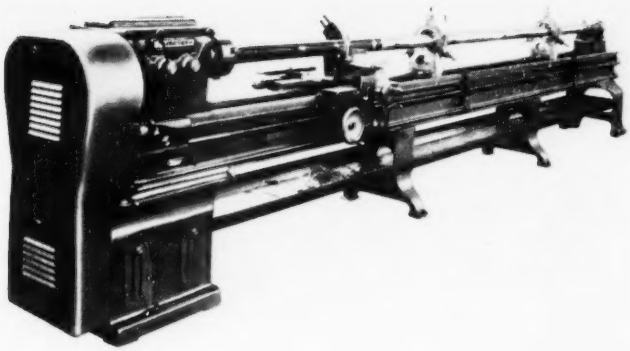


W. G. LE COUNT TOOL WORKS
SOUTH NORWALK, CONNECTICUT, U.S.A.

• For use on Lathes, Grinders or Milling Machines for increased production and also a Time Saver in the Tool Room. Qwik action—no arbor press required.

Designed for Accuracy, Strength and Long Service. No fragile parts to wear out. The three blades used in construction correct any inaccuracy of the bore. A set of 5 will take bores from $\frac{3}{8}$ inch to 4 inch inclusive. Extra keys can be furnished on No. 5 Mandrel for bores to 7 inches.

SINCE 1847



Sebastian 20-Inch Geared Head Lathe with Extra Long Bed

work, including long lightweight pieces.

The Sebastian Lathe is manufactured in 12 and 16-inch as well as 20-inch sizes in general purpose, clutch and brake, and line shaft drive types. Gap and metric screw types are also made in 16 and 20-inch sizes.

Each type of Sebastian Lathe is equipped with an eight-speed geared head having Timken tapered bearings on all headstock shafts and Timken precision bearings on the spindle. Other principal construction features claimed for the lathe include reverse in apron for feeds; knob control handle for apron-length feed friction; 54 feed and thread changes; and accuracy of 0.0005 inch at every point of alignment.

Universal Drilling Tool

Designated as the "Reglus," a universal drilling tool now being distributed by the Cosa Corp., 624 Chrysler Bldg., New York 17, N. Y., is said to provide the quick and easy drilling of round, flat, square, or hexagonal workpieces within an accuracy of 0.0003 inch. With accessories, the tool can be used for drilling holes at predetermined intervals, adjacent holes for making slots, holes at any radial

COOLEY ELECTRIC HEAT TREATING FURNACES

"a complete service"

BENCH MODEL

For hardening—hardening and drawing—preheating for high speed tool hardening. 4 models, 3 sizes—1850° F. and 2000° F.—***$200 to $420***

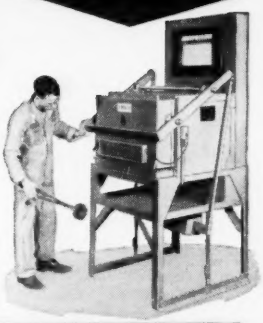
CIRCULATING AIR DRAW

For critical temperature limits. Size 10" x 6" x 14" —900° F. and 1200° F.—***$385 to $410***

INDUSTRIAL BOX **(Shown at right)**

Insulated door covers entire front. Natural convection gives quick and uniform heating. 3 sizes: 12" x 8" x 18", 24" or 36". Single or 3 phase operation—***$850 to $1325***

For process application. Batch, pusher or conveyor type. With or without circulation. Electric or gas fired.



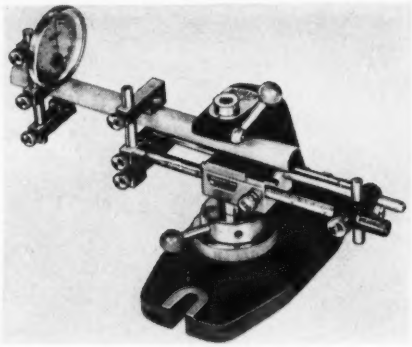
free **"Shop Notes on Heat Treating of Steels"**

COOLEY
ELECTRIC MFG. CORP.
34 SOUTH SHELBY STREET
INDIANAPOLIS 7, INDIANA

INDIANAPOLIS MACHINERY EXPORT CORP. • EXPORT MANAGER, 44 WHITEHALL ST., NEW YORK, NEW YORK

angle, and holes in balls.

Although primarily a drilling tool, the Reglus is an angle comparator in two planes and serves as a depth gage and a center distance comparator on round, square, or hexagonal stock. Designed to accommodate workpieces up to 1¾ inches in diameter, the tool utilizes a series of cylindrical drill bushings having drill holes ranging up to and including ½ inch in diameter. Bushings, inserted from the top, are clamped by an upper ball-grip lever. The required distance between holes is set direct on one of two verniers on the standard V-piece or on the adjustable stop, depending upon the distance of the holes from the top, collar, and so on, or from the end of the workpiece. Work is adjusted upward in the instrument by rotating a knurled barrel nut at the base. For repetition work, a ball-grip lever may be fitted to this setting nut.

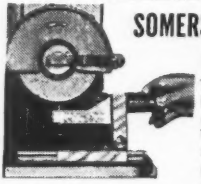


"Reglus" Universal Drilling Tool

Accessories include a V-mount for holding pieces from $\frac{5}{32}$ to $\frac{1}{2}$ inch in diameter; cone mount for drilling balls up to 1⅜ inches in diameter; modified mount for drilling flat and eccentric pieces; and accessory for drilling holes at any radial angle.

Stacking Box

The Style 600 Stacking Box now being manufactured by Bay Metal Products, 3015 N. 16th St., Philadelphia 32, Pa., is described as an ideal all-purpose shop box of sturdy all-welded construction. In addition to a rigid handle and hook hole at each end, the box is provided with heavy skids which act as a positive stacking lock and reinforce the box at the point of maximum wear.



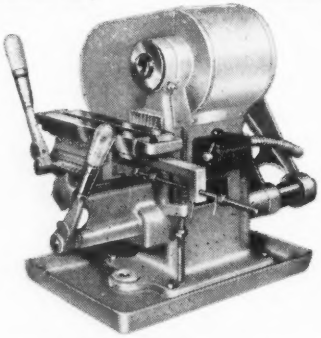
SOMERSET Radius Dresser SAVES TIME

Thousands of Somerset Dressers in service. Offer outstanding features — Wheel is dressed from below, avoids removal of guard. Stop pins permit rotation thru 180° or 90° either direction. Wearever bearing is dustproof.

Write for illustrated folder. *Immediate Delivery*

SOMERSET TOOL CO. 320 Virginia St Hillside, N. J

THIS BURKE BENCH MILLER COSTS *only* $240 (less motor)



It's the little Miller with the big reputation for accurate work. For production, tool rooms, schools, hobbyists. Send for catalogue of hand and power feed models.

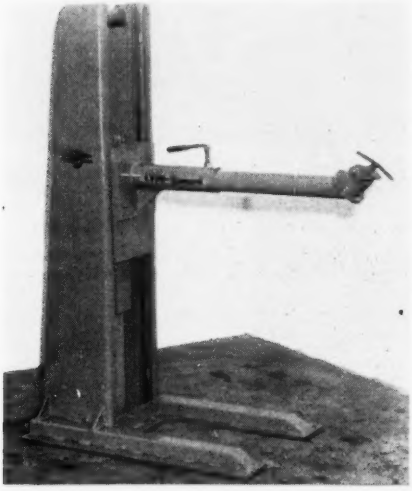
The BURKE MACHINE TOOL CO.
A Division of U. S. Burke Machine Tool Co.
22 East 72nd St. Cincinnati 16, Ohio

BRAZING TORCHES

for soldering, brazing
Other useful shop items.
Write for illustrated circular.
BUFFALO DENTAL MANUFACTURING CO.
Buffalo 3, New York

Hydraulic Elevating Positioner

The Lyon-Raymond Corp., 20358 Madison St., Greene, N. Y., has introduced a hydraulic elevating positioner which is available in several models, each having an elevating mounting plate so arranged that various types of fixtures can be installed. The model illustrated has an adjustable revolving arm to which various products can be mounted for assembly or welding operations. Various other standard attachments are available, such as an



Lyon-Raymond Hydraulic Elevating Positioner

Aronson universal balanced positioning arm, a standard platform, a special low height platform, and adjustable forks. Special brackets and fixtures can be designed to meet a particular need where standard fixtures cannot be used.

The Lyon-Raymond Hydraulic Elevating Positioner can be operated by a hand pump, foot pump, electric power, or air operated pump. The capacity of the positioner is 1,000 pounds.

Descaling and Cleaning Attachment

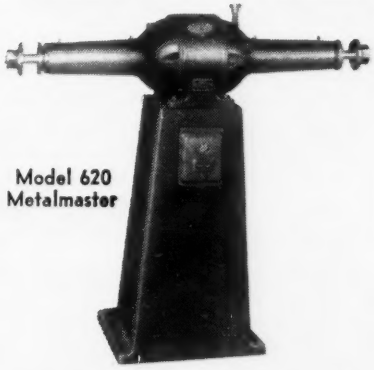
For removing scale, rust, concrete, old paint, and so on, from pipes and tubes, the Continental Machine Co., 1952 Maud Ave., Chicago 14, Ill., has announced a

1st in Finishing!

BRADFORD

BUFFERS - POLISHERS

BRADFORD manufactures a complete line of buffing and polishing lathes. Seventeen models, in a wide range of styles, spindle speeds and power capacities, permit you to select the *right* tools for your product finishing operations. And Bradford builds *years of service* into these quality tools. See your Bradford distributor or write direct for specifications and design details, outlining your job requirements.



Model 620
Metalmaster

Four Ball Bearing Buffer

Heavy-duty buffer built for hard and continuous service. Slope front base. Bearings sealed in dust-proof housings. Positive shaft lock. Push-button magnetic starter with overload protection and undervoltage release. 2, 3, 5, 7½ h.p. models. Spindle lengths range from 47 - 50 inches.

A free copy of the complete Bradford Tool Catalog of Buffers, Polishers, Grinders and Drills will be sent on request.

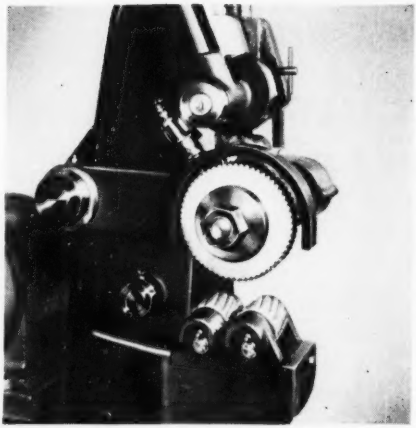
THE BRADFORD MACHINE TOOL CO.

658 Evans St., Cincinnati, Ohio

Precision Since 1840

descaling and cleaning attachment which can be quickly and easily installed on the Steen Cut-Off Machine. When required, the attachment may be readily removed from the machine so that cutting operations can be performed

The attachment consists of an upper drive roll and two lower rolls with roller bearings, hardened pins and roller blocks attached to a base plate. In operation, the large upper roll serves as the drive, while the two lower rolls feed the pipe through the machine automatically. Only one pass of the work through the rolls is said to be required in order to completely descale and clean the work. The attachment is designed to feed up to 20 feet of pipe per minute, thus making it applicable for production work as well as intermittent use.

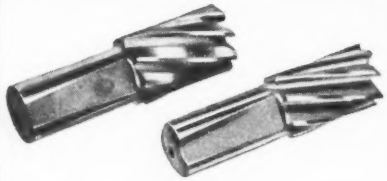


Close-Up View of Steen Cut-Off Machine Equipped with Descaling and Cleaning Attachment

Small Tap

A small carbon steel tap which is designed to provide for long life and the production of precise threads has been introduced by Woodruff & Stokes, Quincy 69, Mass. Available in standard or special sizes up to No. 2 (0.086 inch) and having up to 260 threads per inch, the tap features highly polished threads and flutes to minimize drag. Cutting edges are specially heat treated to provide unusual hardness and have high strength due to the radial chamfer. Extra chip clearance

YOU PROFIT on every job you send to Rutland!



Rutland reworked or repaired cutting tools are guaranteed to give new tool performance — at a fraction of the new tool cost.

Recutting • repairing • replacing Carbide tips. Special tools from obsolete or standard tools, etc.

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Rutland TOOL SERVICE

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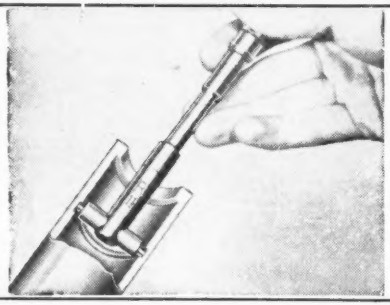
TOwnsend 8-1661



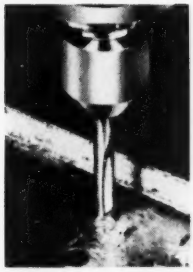
INSIDE MICROMETERS

Measure: "O" Ring Grooves
Snap Ring Grooves
From ½" to 12"

Write for information

RIMAT MACHINE TOOL CO.

1115 AIR WAY **GLENDALE 1, CALIF.**



W-S Small Carbon-Steel Tap in Use

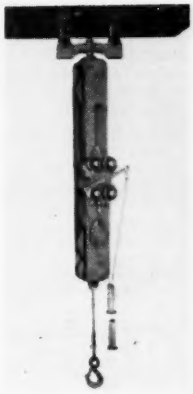
is said to be provided by the radial flute.

According to the manufacturer, the tap is accurate to within ± 0.002 inch on the pitch diameter. Taps having special pitch diameters or thread profiles are available on special order.

Dual-Load Balancing Hoist

Designed to neutralize weight of the balanced object in any position of the balancing range, the Platz Dual-Load Balancing Hoist shown herewith has been placed on the market by The Platz Co., Inc., 20433 Sherwood Ave., Detroit 34, Mich. Constructed to operate on a 4 or 6-inch Standard I-beam, the hoist may be swiveled vertically from 0 to 17 degrees and rotated 360 degrees. The unit is manufactured in balancing ranges of 36 and 42 inches.

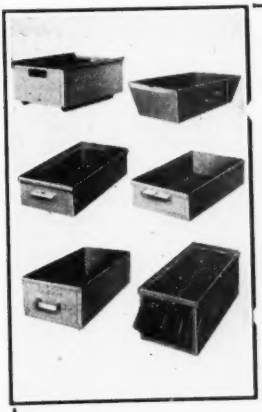
In operation, the low pressure side of the balancer is adjusted to balance the hook or cradle, and the high pressure side of the balancer is adjusted to balance the total load. High and low pressure is applied by a convenient hand control. After the hook is engaged with the load to be balanced, the high pressure handle is pulled and immediately the load is neutralized. Both hands can be used to quickly move the load up and into position with "cat-paw" action. When the high pressure is released, the low pressure is applied by the same action.



Platz Dual-Load Balancing Hoist

Multiple Drill Head

For drilling, tapping, and reaming operations, the Noble Machine Tool Co., 222 East St., Pawtucket, R. I., is marketing

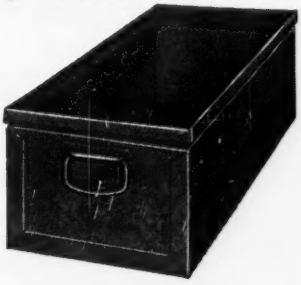


Top Rim STEEL STACKING BOXES
18" x 12" x 6". 16 Ga.
with Drop Handles

STANDARD SIZES

16 x 10 x 6.....18 Ga.
16 x 10 x 6.....16 Ga.
18 x 12 x 6.....16 Ga.
18 x 12 x 8.....16 Ga.

MADE IN OTHER SIZES



WE MANUFACTURE ALL TYPES OF STEEL BOXES

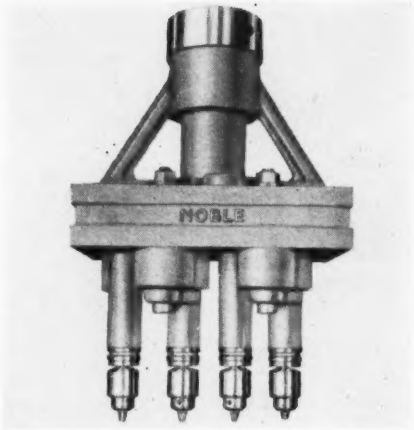
We make a specialty of boxes made to fit your particular handling requirements. Special boxes designed so they can be run thru with standards enable us to quote prices comparable with that of a standard box.

STERLING
FACTORY EQUIPMENT CO
183 CHARLES ST. PROVIDENCE, R. I.

the Noble MS4 Four-Spindle Adjustable Drill Head shown herewith, which has a capacity for drilling holes up to $\frac{7}{8}$ inch and is equipped with an enclosed gear drive of 2 to 1 ratio. The spindles are available with No. 1 Morse tapers or chucks of the user's choice, and revolve in needle bearings with full ball thrusts.

Employing all four spindles, the head can be used to drill straight-line, staggered, or equidistant holes on centers from $1\frac{1}{4}$ to $9\frac{1}{4}$ inches. With two or three spindles, holes can be drilled on centers from $1\frac{1}{4}$ to $10\frac{1}{2}$ inches. The head has a radial adjustment of from $1\frac{7}{8}$ to 7 inches in diameter, and is designed to drill holes in a rectangular pattern up to $5\frac{1}{2}$ x $8\frac{1}{2}$ inches.

Fixed heads, as well as six and eight-spindle straight-line adjustable heads, can be made to user specifications.



Noble MS4 Four-Spindle Adjustable Drill Head

LITTELL Air-Blast Valve automatically ejects pieces from punch presses. Keeps operator's hand out of danger zone. Increases safety and speed. Air nozzle quickly adjustable.

Other Littell safety devices include Pres-Vac Safety Feeders for picking up and feeding flat-surfaced materials; also, air-operated Mechanical Pickers for feeding pieces that vacuum lift will not pick up.

Littell makes a complete line of Automatic Reels, Feeds, Straighteners, Scrap Cutters, etc. *REQUEST BULLETINS*

F. J. LITTELL MACHINE CO.
4163 N. Ravenswood Ave., Chicago, Ill.

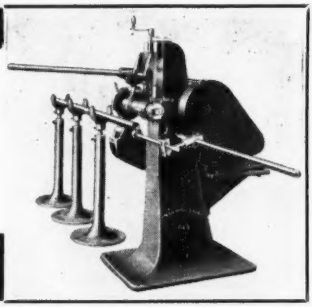
Hydraulic Diamond Turner

The Citco Model 1002-A Hydraulic Diamond Turner illustrated herewith, product of the Cleveland Industrial Tool Co., 1080 E. 22nd St., Cleveland 3, Ohio, is adjustable to three ranges of degrees. It turns and holds the diamond rigidly by hydraulic means, generating on the diamond a definite and consistent sharp edge in any one of the three ranges and automatically repositioning the diamond every $3\frac{1}{2}$°, 7, or $10\frac{1}{2}$ degrees respectively. Turning impulses are so timed as to automatically split the segment on the diamond

FASTER TUBE AND PIPE CUTTING

STEEN High-Speed pipe, tube and column cutoff machines embody unique design and rigid construction features to greatly step up cutoff operations. Available in three sizes to cut diameters ⅛" to 3"; ⅛" to 6"; 3" to 12".

Write for Circular Today



CONTINENTAL MACHINE CO.
1952 Maud Ave. • Chicago 14, Ill.

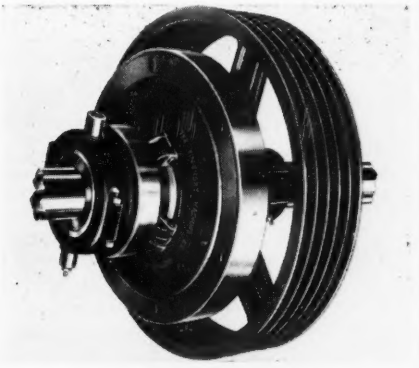
Citco Model 1002-A Hydraulic Diamond Turner

face at the completion of the turning cycle, thereby maintaining a new and ever-ready cutting edge throughout the life of the diamond and eliminating exposure of a flat surface to the grinding wheel.

According to the manufacturer, the Citco Model 1002-A Hydraulic Diamond Turner is precision built and made to last the life of the machine of which it becomes a rigid and permanent part. Moving parts are sealed in oil.

Disc Clutch

The Edgemont Machine Co., Dayton, Ohio, has announced the standardization on Worthington QD sheave rims for V-belt drive applications in A, B, C, and D sections where a clutch is desirable. The



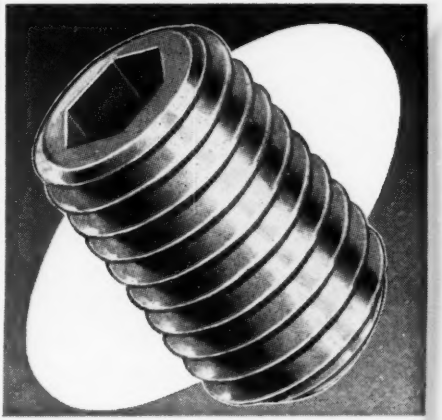
Edgemont Type SF Disc Clutch Installed in V-Belt Sheave

Quality....

Everybody talks about it

B-RIGHT-ON NU-Process

...really assures it!



New methods, incorporating an entirely new metal-working process, make unvarying top quality a fact, not just a claim with Brighton Socket Screw products. Specially selected alloy steel, meeting Brighton's rigid specifications, is formed by Brighton's Nu-Process into screws with continuous unbroken fibers and fine compact grain. Carefully heat-treated under electronic control every screw has the exact hardness and strength needed.

For full details on Brighton Screws, send for your copy of New Catalog.

BRIGHTON

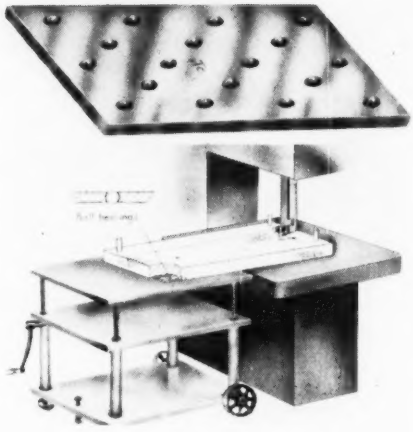
Screw & Mfg. Co.

READING RD. at DORCHESTER

CINCINNATI 2, OHIO

clutch mechanism is the standard Edgemont gear tooth drive, known as the Type SF, which is designed for starting and stopping the flow of mechanical power. The mechanism is installed between the motor and drive machine and may be engaged and disengaged at the will of the operator.

The clutch incorporates an entended bronze bushed sleeve, tapered on the outside diameter to fit the tapered bore of the Worthington QD sheave. To assemble the sheave on the sleeve, it is necessary only to remove the grease fitting, place the sheave over the taper, and use the standard Worthington QD sheave pull-up bolts to draw the sheave snugly into place. To demount the sheave, the same bolts are used as jackscrews in the taps provided for the purpose. The complete assembly of clutch unit and sheave can be supplied for ready installation on the shaft.



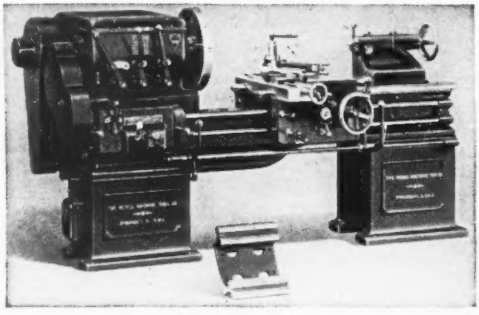
Tietzmann Ball Bearing Parallel

Ball Bearing Parallel

A ball bearing parallel for heavy and medium work support movement is now being marketed by the Tietzmann Tool Corp., 318 N. Main St., Englewood, Ohio. The unit consists of bearing balls $\frac{3}{8}$ inch in diameter assembled in a steel plate $2\frac{1}{2}$ inches wide x 6 inches long.

The parallel can be applied direct under flat-base work or equipment. A flat plate can be interposed under work which is

NEBEL Removable Block Gap Lathes furnished in the Geared Head Motor Driven Type, 3 Step Cone Double Back Gear Belt Driven Type or with Motorized Headstock. Especially adapted for repair and maintenance as well as for general manufacturing. Handle a large variety of work with large swing through the gap.



All Geared headstock type completely equipped with Timken Bearings, headstock completely enclosed, running in oil, with motor mounted on rear of lathe, drive through multiple vee belts and friction clutch. Standard equipment consists of: Quick change gear box, compound rest, steady rest, chasing dial, face plate, driver plate, wrenches, tool post and centers.

Furnished in four different sizes as follows: Series "LN" 18/27", Series "A" 20/30", Series "B" 22/34", and Series "D" 25/40".

The Nebel Machine Tool Co.
CINCINNATI OHIO

not flat to provide for free movement and accurate alignment on a machine table or in transfer between table and truck. The parallel can be supplied in a set of four packed in a hardwood carrying case.

Dust Collector

Designed to handle dust from grinding, buffing, and polishing machines, as well as other dust sources, a heavy duty portable unit dust collector designated as the Type "M" has been announced by The

Kirk & Blum Type "M" Unit Dust Collector

Kirk & Blum Mfg. Co., 2816 Spring Grove Ave., Cincinnati 25, Ohio. The collector is available in three models with capacities of 450, 900, and 1,800 c.f.m. at high velocity.

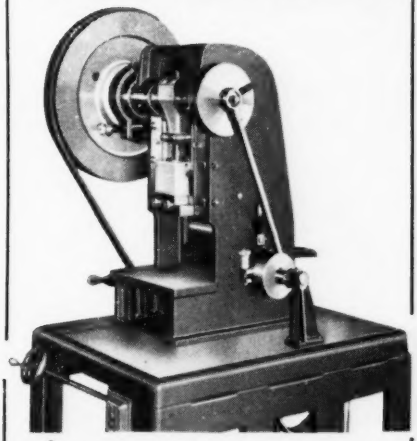
Compactly made and completely self-contained, the unit consists of a motor, exhauster, centrifugal precleaner, and steel wool filter aftercleaner. In operation, the dust-laden air is delivered to the small diameter high efficiency centrifugal precleaner where all but the finest particles are removed. The air then passes through the 3-inch thick steel wool filter aftercleaner for final cleaning.

The motor and direct connected exhauster are completely isolated from dust and are said to eliminate any fire hazard. The 3,600 r.p.m. 220/440-volt motor is amply ventilated and readily accessible

NEW

Outstanding Addition to

AUTOMATIC FLEXOPRESS LINE

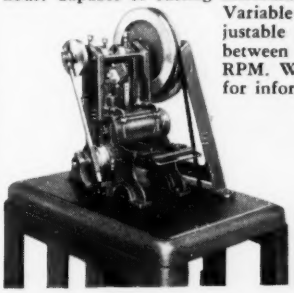


12 TON PRESS

The success of the Automatic 1½ to 2 ton press prompted many inquiries for a larger press. Now we can announce the addition of the new 12 ton press to our standard line. High speed, completely automatic and capable of cutting materials in lengths up to 12".

1½ TO 2 TONS

The 1½ to 2 ton press completely automatic. Can produce 9,000 to 40,000 pieces per hour. Capable of cutting materials up to 9". Variable speed, adjustable to values between 150 to 600 RPM. Write today for information.



Ace Tool & Die Works

129 E. McMICKEN AVE., CINCINNATI 10, O.

through a removable expanded metal panel. Dust receptacles are gasketed sliding drawers secured with a handwheel to ensure a leakproof seal.

Where conditions will not permit the re-entry of cleaned air into the working area, the filters are replaced with air-tight closures and the air vented to the outside. Exhaust stock connections can be furnished at the top or any side of the unit. Where it is desired to return the cleaned air to the building during the winter months to conserve heat and to vent it to the outside during the summer months to improve ventilation, the unit may be equipped with both exhaust stack and filters. The change is effected by merely turning a damper in the stack.

DUST MASK

Ideal protection for grinders, polishers, buffers. Easy breathing. 40 sq. in. filter area. Weighs only 4 oz. U.S.B.M. approved for type "A" dusts. Sample $2.50 p.p.

Jerry Bryant Products,
Dept. M.
919 N. Michigan Ave.
Chicago 11, Ill.

AUTOM

CONTINUOUS HINGES

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AUTO MOULDING & MFG. CO.

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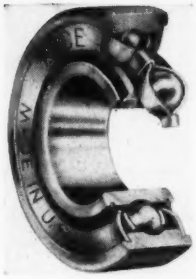
Composition Sealed Ball Bearing



Nice Composition Sealed Ball Bearing

The Nice Ball Bearing Co., 30th & Nicetown Lane, Philadelphia, Pa., has announced the manufacture of a sealed bearing of simplified design. Referred to as "composition sealed," the new design involves the use of an oil-resistant rubber-coated fabric in contact with a specially formed metal shield which is claimed to effectively retain lubricant and exclude foreign material.

Heretofore available metal shielded only, Nice 1600 and 3000 series bearings are now offered with the new composition seal. The Series 1600 are "ground all over" precision annular bearings, while the Series 3000 are unground radials of the same precision type.

Tap Hammer

For use in machine shops, toolrooms, assembly rooms, factories, and so on, the Ready Tool Co., Bridgeport, Conn., has announced the Red-E "Tap-A-Hammer," a unique type of hammer designed for work requiring a direct tap rather than a leverage blow. Weighing 12 oz. and well balanced, the hammer has tappers on both ends which are made of a plastic material that is compressible and is said

DRILL and PILOT BUSHINGS
Frictionless —Rotary

For core drilling, T. C. and high speed boring, turret tool, piloting, etc. Won't stick or clog. Dust proof as a watch. *Write for details.*

GATCO ROTARY BUSHINGS CO.
1300 Mt. Elliott Ave. Detroit, Mich.

Red-E "Tap-A-Hammer"

to be capable of absorbing the shock of the tap.

Made of solid steel with chrome finish and diamond knurl in the center to provide a firm hand grip, the Tap-A-Hammer is furnished complete with two finger-grip adjustable clips that can be fastened to practically any surface for holding the hammer in a safe and convenient place when not in use.

Clamp Template Kit

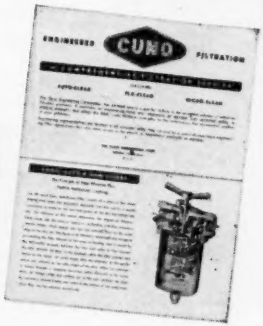
A kit of clamp templates in half size to supplement the full sized templates is now being offered by Lapeer Mfg. Co., 3056 Davison Rd., Lapeer, Mich. The new size is said to effect great savings in time. Instead of facing the time-consuming task of scaling down a full sized clamp template to match user simply slips the half sized template under the velum and is ready to trace in the exact size he requires. Each template shows six views (front, side and top views of right and left-hand applications), and provides the pertinent dimensions.

The kit contains a template of every Lapeer "Fixed or Mounted Type" Clamp, and is available without charge to persons addressing requests on their company letterheads.

Weight-Loaded Lubricator

The development of weight-loaded lubricator for the application of greases and oils to stuffing boxes of pumps and mixers, motors, engines, heavy machinery, line shafting bearings, motorized and lubricated valves, and so on, has been announced by the Mixing Equipment Co., 1024 Garson Ave., Rochester 9, N. Y. Since weights of different values may be used and infinitely adjusted throughout the length of the lubricator arm, pressures may be applied to lubricants up to 150 p.s.i. By using additional

Get these facts on the one fluid strainer



that will last as long as the equipment it's installed on

For longest service, no replacement, put Cuno AUTO-KLEAN — the only disc-type self-cleaning strainer—on your fluid lines. It's all metal, non-collapsible, *permanent.*

Guaranteed to remove all particles larger than specified.* Continuously-cleanable . . . no need to stop flow. Single unit handles full flow in same space as usual partial-flow type.

Widely used on lubricating, hydraulic, and fuel oils, water, and all industrial fluids.

*Available spacings from .0035 in. to .062 in.

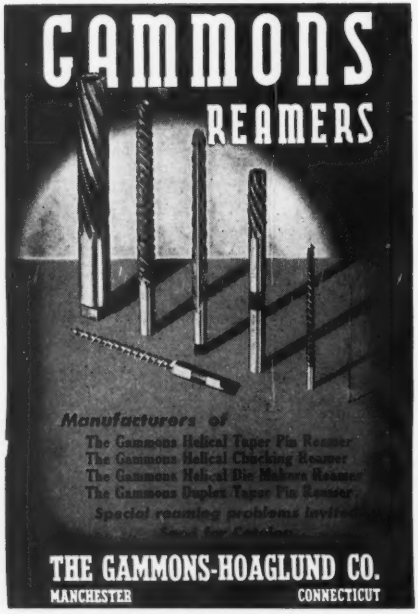
No Fluid Is Better than Its Filtration

CUNO

Fluid Conditioning

Removes More Sizes of Solids from More Types of Fluids

For valuable information on fluid-straining, address Cuno Engineering Corp., 185 South Vine Street, Meriden, Connecticut.



Weight-Loaded Lubricator

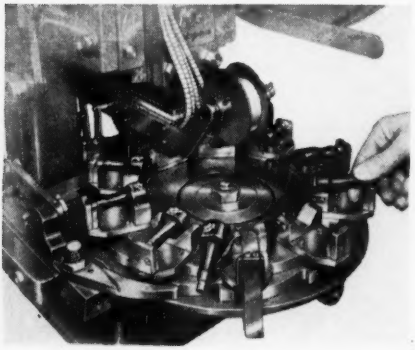
weights, even high pressures may be obtained.

The device has a bracket for universal mounting, with a shutoff valve available as optional equipment. The grease cup has a capacity of 7½ oz. and is provided with a conical bottom to facilitate lubricant passage. Replenishment of lubricant may be effected without disassembling the lubricator, which supplies the lubricant through a standard grease fitting located at the bottom of the grease cup. Due to its unique yoke and pin construction and the simple grease cup cover, the unit can be taken apart with the use of tools.

Power Press Marking Assembly

For hot stamping wood or plastic handles in color, The Acromark Co., 9 Morrell St., Elizabeth 4, N. J., has announced an assembly for use in its standard Series "A" power presses. The assem-

Close-up view of marking assembly installed on Acromark Model 2A Press

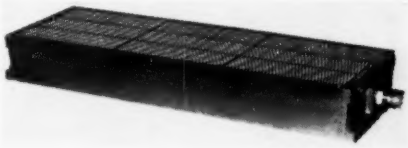


bly consists of a stamping head which is locked in the press ram by means of a standard shank and is so constructed as to accommodate readily interchangeable lettering or design dies heated by cartridge type electric heating elements. An automatic tape feed unit attached to the head carries the color foil underneath the die and automatically advances at each stroke of the ram.

A standard dial feed with ten or more stations is mounted in the bed of the press. At each station on the dial is a floating type holding fixture to accommodate the handles to be marked. After marking, each part is ejected automatically by a finger that lifts the part from its holding fixture. The heat used in marking is controlled by a thermostat, and all heated parts are fully insulated. Guards are provided where needed, and the complete assembly includes push-button controls, gear reduction motor drive, and all incidentals.

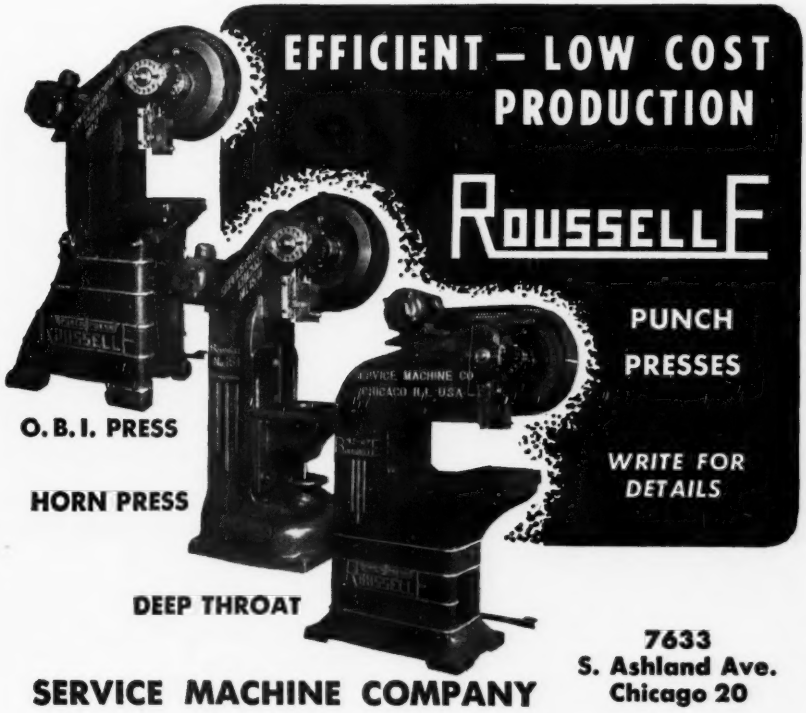
Vacuum Chuck

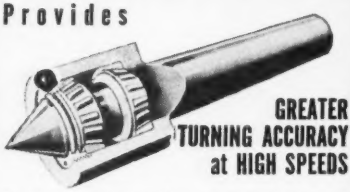
Claimed to be particularly useful for industries processing non-ferrous materials, the vacuum chuck illustrated here-



Walker Vacuum Chuck

with has been developed by the O. S. Walker Co., Inc., Worcester 6, Mass. Available in a wide range of sizes, the chuck is said to be ideal for use by electrical manufacturers in holding insula-



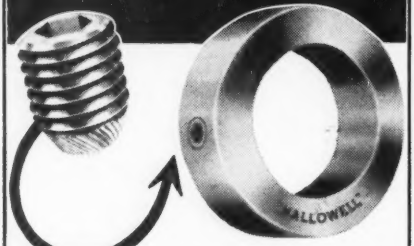
FALLS ROTO CENTER
Provides

GREATER TURNING ACCURACY at HIGH SPEEDS

Precision construction and bearing arrangement of Falls Roto Center allows tailstock center to rotate with the work and retain "dead center" accuracy and rigidity.

Two precision quality heavy-duty Roller Bearings, perfectly matched, give smooth, anti-friction rotation at highest speeds. Result is extreme accuracy at maximum production rate.

Write for complete facts in Bulletin MM today.

FALLS PRODUCTS, INC.
124 Genoa St. Genoa, Ill.

HALLOWELL
Steel Collars


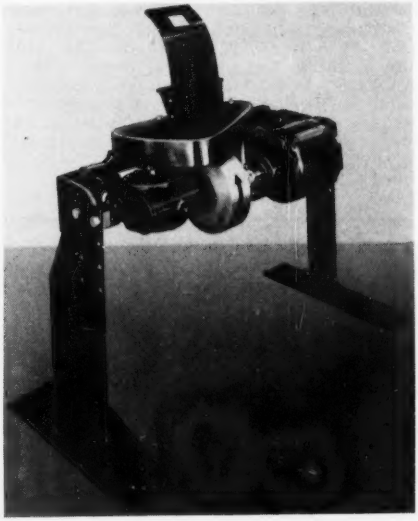
HALLOWELL Solid Steel Collars, functionally proportioned throughout . . . precision-machined so faces run perfectly true . . . and fitted with the famous UNBRAKO Knurled Point Self-Locking Socket Set Screw.

STANDARD PRESSED STEEL CO.
JENKINTOWN 22, PENNSYLVANIA

tion materials during milling ("skining") and the routing of plastics and rubber compositions, both thick and thin.

Scrap Chopper

Designated as the Model No. 400, an automatic scrap chopper announced by the Durant Tool Supply Co., 155 Orange St., Providence 3, R. I., is designed to handle scrap material, as it comes from a punch press, up to 6 inches wide and up to 0.125 inch in thickness. According to the manufacturer, the unit can be used with any power press with any type of automatic feed or hand feed, and operates equally effectively whether the feed is on the left or right-hand side of the press or the front or back.



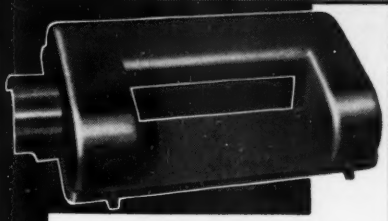
Durant Model No. 400 Automatic Scrap Chopper

The construction of the Model No. 400 permits it to be quickly and easily shifted from one power press to another. The unit is operated by a 220-440 volt, ¾ h.p., single phase motor.

Threading Attachment

A threading attachment for use with Lehmann lathes has been placed on the market by the Lehmann Machine Co.,

GEAR GUARDS



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FABRICATORS OF PLATE AND SHEET METALS

LITTLEFORD

LITTLEFORD BROS., INC.
433 E. Pearl St., Cincinnati 2, Ohio

JIG BORING!

PUT SMALL JOBS ON THIS LINLEY MACHINE

Pays for itself on die, jig and fixture work as well as molds for plastics, metal pattern work, laying out drilling, milling and boring operations.
Fast and simple with correct speeds to insure safety to tools. Ball bearing equipped; micrometer screw feed head.

Write for Bulletin M.

LINLEY BROS. CO.
661 State St. Ext. Bridgeport 1, Conn.

Amswiss

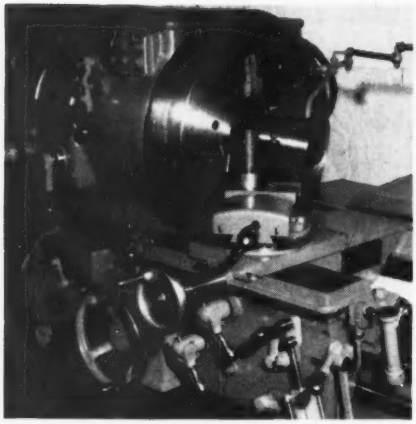
AMERICAN-PATTERN FILES

A complete line of all standard shapes, sizes and cuts of files and rasps . . . each one guaranteed to be of top-notch fast-filing, long-wearing quality. Write for catalog.

Also: Milled Curved Tooth Files
Swiss-Pattern Files
Mechanics' Hand Files
Rotary Files

ONLY THE BEST ARE GOOD ENOUGH

American Swiss File & Tool Co.
410 Trumbull St., Elizabeth 1, N. J.



Lehmann Lathe Equipped with Threading Attachment

3560 Chouteau Ave., St. Louis 3, Mo. The attachment is used in connection with an automatic stop which, when contacted by the carriage automatically and simultaneously disengages the half nuts of the carriage and causes the threading tool to be backed out from the work. To engage the half nuts and simultaneously feed the tool to the correct depth, a button on the attachment is merely pressed.

Said to provide for accurate repeat operations regardless of the speed employed, the attachment can be set for producing external or internal threads, right or left-hand threads, and straight or tapered threads. The attachment can be furnished on any size or style of Lehmann lathe and may also be applied to 22-inch and larger sizes of Lehmann lathes in the field.

Hydraulic Cylinders

The Northern Tool & Machine Co., Melrose Park, Ill., has announced a line of single and/or double-action high pressure hydraulic cylinders available to equipment manufacturers. Designed for working pressures of 4,000 p.s.i. in a range from 5 to 60 tons, the cylinders are all steel with hard chrome finished moving parts. Dual seals are used at all points to assure long life; and, since the cylinders are designed for high pressures, they are said to permit consolidated and compact piping arrangements.

NOW CALIBRATE and CHECK

EXTENSOMETERS • STRAIN GAGES • DIAL GAGES • TEST INDICATORS

***ACCURATELY and QUICKLY with the* CSI-TEMPLIN CALIBRATOR**

ACCURATE
PORTABLE
RUGGED
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INEXPENSIVE

- **DIRECT READING TO TWO MILLIONTHS (.000002) INCH.**
- **TOTAL RANGE OF MEASUREMENT FOUR HUNDREDTHS (.040) INCH.**
- **CALIBRATES INSTRUMENTS WITH GAGE LENGTHS 0.10 INCH TO 10 INCHES.**
- **AVAILABLE IN TWO MODELS**
  CS-28A - INVAR
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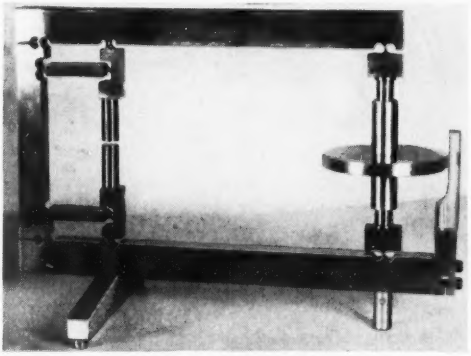

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IMMEDIATE DELIVERY

Extra Long Length

High Speed DRILLS

Straight Shank
No. 1 - 60

No. By Gage	Length Inches	Our Price Net Each
1 to 10	6 1/4	$ .90
11 to 20	5 3/4	.80
21 to 30	5 3/8	.70
31 to 40	5 1/4	.60
41 to 50	4 1/2	.50
51 to 60	4 1/4	.40

Size Inches	Length Overall Inches	Length Flute Inches	Price Each Net
1/8	12	9	$1.50
9/64	12	9	1.50
5/32	12	9	1.50
11/64	12	9	1.50
3/16	12	9	1.50
13/64	12	9	1.60
7/32	12	9	1.60
15/64	12	9	1.75
1/4	12	9	1.75
17/64	12	9	1.85
9/32	12	9	1.85
19/64	12	9	2.00
5/16	12	9	2.00
21/64	12	9	2.25
11/32	12	9	2.25
23/64	12	9	2.50
3/8	12	9	2.50
25/64	12	9	$2.75
13/32	12	9	2.75
27/64	12	9	3.00
7/16	12	9	3.00
29/64	12	9	3.25
15/32	12	9	3.25
31/64	12	9	3.25
1/2	12	9	3.25
17/32	15	12	6.50
9/16	15	12	7.00
19/32	15	12	7.50
5/8	15	12	8.00
21/32	15	12	8.00
11/16	15	12	8.25
23/32	15	12	8.50
3/4	15	12	8.50
25/32	15	12	9.50
13/16	15	12	11.00
27/32	15	12	11.50
7/8	15	12	12.00
29/32	15	12	12.50
15/16	15	12	13.00
31/32	15	12	14.00
1	20	15	16.00
1-1/16	20	15	17.00
1-1/8	20	15	18.00
1-3/16	20	15	20.00
1-1/4	20	15	22.00

VICTOR MACHINERY EXCHANGE, Inc.

251 Centre St. Phone: CAnal 6-5575 New York 13, N. Y.

New Shop Literature

The publications listed in this section may be obtained free upon written request on company letterhead to the manufacturers concerned. Your courtesy in mentioning MODERN MACHINE SHOP when requesting copies of these publications will be sincerely appreciated by the manufacturer and the publisher of this magazine.

Automatic Centering Reels, available in both plain and motor-driven types, for holding coils of from 300 to 6,000 lb. are illustrated and described in a four-page two-color circular (Section 5-EE) published by the F. J. Littell Machine Co., 4163 N. Ravenswood Ave., Chicago 13, Illinois.

Metal-Turning Lathe. Logan Engineering Co., 4901 W. Lawrence Ave., Chicago 30, Ill., is now distributing Folder 955 which illustrates and describes the new Logan "955" Metal-Turning Lathe with 1-inch collet capacity, 11-inch swing, 1¾-inch spindle hole, and 24 inches between centers (36 inches between centers also available).

Machine Tools. A four-page two-color folder now available from J. L. Lucas & Son, Inc., Bridgeport 5, Conn., lists a wide variety of reconditioned machine tools available from the company, include grinders, lathes, milling machines, presses, planers, power square shears, shapers, screw machines, turret lathes, boring mills, boring machines, radial drills, gear machinery, multiple spindle drills, nut and bolt equipment, and so on.

Multi-Purpose Crank Shapers. A 24-page three-color catalog (No. GC15) published by the General Engineering & Mfg. Co., 4417 Oleatha Ave., St. Louis 16, Mo., presents complete information on a line of multi-purpose crank shapers for all requirements, including universal type shapers, production type shapers, and plain type shapers. Illustrations, together with descriptions, of the important features of the machines are presented, as well as data on the lubrication system, unilateral table control, centralized controls, tables for all purposes, vises, and various accessories. In addition, a complete table of specifications and dimensions of plain, production and universal shapers is provided.

Baldor

RUGGED-BUILT for the long, hard grind

—these Grinders have BALANCED rotors & wheels

BALDOR heavy-duty Grinders are balanced 2 ways: each rotor is dynamically balanced; each wheel is balanced with Baldor's patented flanges. Fully guaranteed. SHOWN HERE: No. 7120, ½ h.p. ball-bearing motor, two 7" wheels (36 grit and 60 grit), fully adjustable tool rests **$60.00**

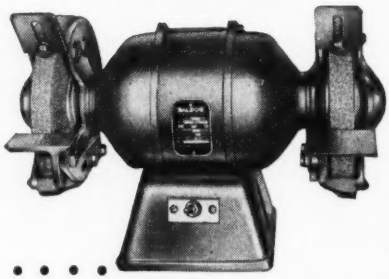
ASK FOR BULLETIN 321-D

BALDOR ELECTRIC COMPANY

Motors - Grinders - Battery Chargers

4380 Duncan Ave. **St. Louis 10, Mo.**

HEAVY-DUTY TYPE



High Frequency Combustion Unit for the ignition of iron and steel samples in carbon and sulphur determinations is illustrated, described, and listed as to specifications in Bulletin No. 910 available from the Lindberg Engineering Co., 2469 W. Hubbard St., Chicago 12, Ill. Also illustrated and described is a volumetric carbon determinator.

"Performance Counts" is the title of an eight-page two-color bulletin published by the Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio, which illustrates and explains unusual operations of Gilbert Horizontal Boring Mills.

Automatic Roll Markers. A four-page technical bulletin (No. NM-49) covering a new line of standard automatic roll marking tools for screw machines is now available from New Method Steel Stamps, Inc., 149 Jos. Campau, Detroit 7, Mich. A general outline of the uses and features of the roll markers is included, together with an illustration of the unit, dimensional drawings of the Models 300-B and 300-C, and drawings showing the four different methods of setup possible.

Bronze Bearings. A 1950 edition of its industrial bearing catalog has been announced by the Johnson Bronze Co., 590 S. Mill St., New Castle, Pa. Designated as the No. 500, this 84-page catalog includes complete data on general purpose bronze bearings, universal bronze bars (cored, solid and hexagon) babbitt metal, cast bronze graphited bearings, and electric motor service bearings.

Universal Die Casting Machine. A four-page bulletin issued by The Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio, illustrates and describes in detail the Cleveland Model 50 Universal High-Pressure Hydraulic Die Casting Machine which can be furnished either as a gooseneck machine or a cold chamber machine.

Oil Bath Air Cleaner and Intake Silencer. The American Air Filter Co., Inc., 100 Central Ave., Louisville 8, Ky., has published an eight-page two-color bulletin (No. 130-E) covering new designs and improvements in its Cycoil Oil Bath Air and Gas Cleaners. Selection charts, dimension tables, and detailed engineering data are included.

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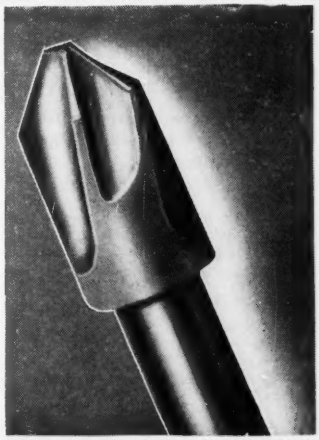

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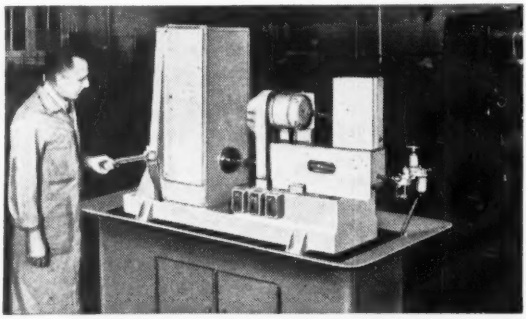
Micrometers. The L. S. Starrett Co., Athol, Mass., has issued a four-page two-color bulletin illustrating and describing the many features of its complete line of Satin Chrome Micrometers.

Hole Punching and Notching Equipment for use in the fast and efficient fabrication of television, radar, and radio chassis is illustrated and described in a four-page bulletin (No. 7) available from the Wales-Strippit Corp., 345 Payne Ave., North Tonawanda, New York.

Machine Keys, including gib head keys, taper keys, straight keys, and round end feature keys, are covered as to prices, dimensions, construction, and so on, in an eight-page catalog available from the John Gillen Co., Inc., 2542 S. 50th Ave., Cicero 50, Illinois.

Grinders and Buffers. The Hisey-Wolf Machine Co., Cincinnati 8, Ohio, has published a 36-page two-color catalog (No. 71) presenting illustrated, descriptive, and tabular information on a complete line of electric grinders and buffers, including bench and pedestal grinders, combination wet and dry grinders, disc grinders, drill grinders, snagging grinders, wet grinders, tool post grinders, vertical spindle grinders, precision grinders, buffing and polishing machines, and so on.

"Cutting Maintenance Costs with Aluminum Bronze Electrodes," a paper presented at the 13th annual meeting of the American Welding Society by Joseph A. Cunningham, president of the J. A. Cunningham Equipment Co., Philadelphia, Pa., is now being distributed by Ampco Metal, Inc., Milwaukee 15, Wis. The article discusses the successful salvage and repair of many worn or broken parts hitherto replaced with new parts. Such parts as pump shafts, gears, clutch pinions, cable idlers, overhead crane track, and milling cutters are mentioned.



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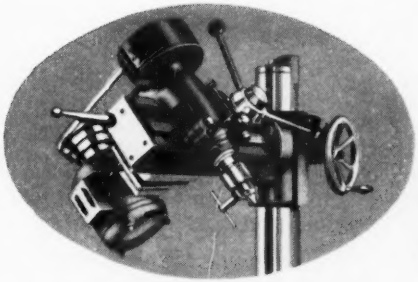

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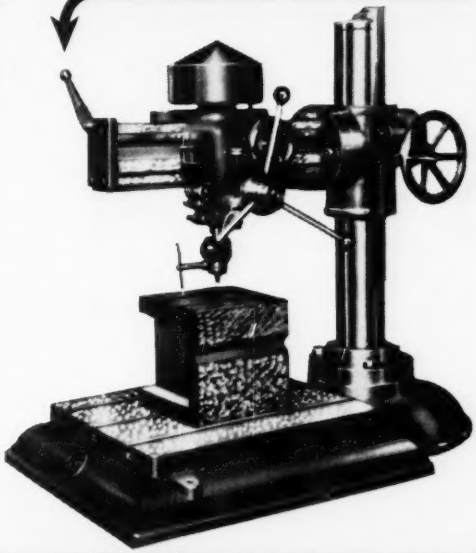

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Skin Cream. A four-page pocket-size folder descriptive of Tarbonis Cream for the relief of occupational skin irritations is now available from the Tarbonis Co., 4300 Euclid Ave., Cleveland 3, Ohio.

Portable Elevating Table. A four-page two-color bulletin (No. P-50) issued by The Hamilton Tool Co., 828 S. 9th St., Hamilton, Ohio, fully illustrates and describes the "Portelvator," a portable elevating table for lifting, lowering, and transporting materials in and around machine shops, tool and die rooms, and so on

Band Saw Wheel Tire. Carter Products Co., 959 Michigan Trust Bldg., Grand Rapids 2, Mich., has published a four-page two-color illustrated folder on its "Jiffy-Tire" for band saw wheels. Complete product and application data are provided.

Electronic Resistance Welding Control Equipment, both synchronous and non-synchronous, is described in detail in Booklet B-4309 available from the Westinghouse Electric Corp., P.O. Box 2099, Pittsburgh 30, Pennsylvania.

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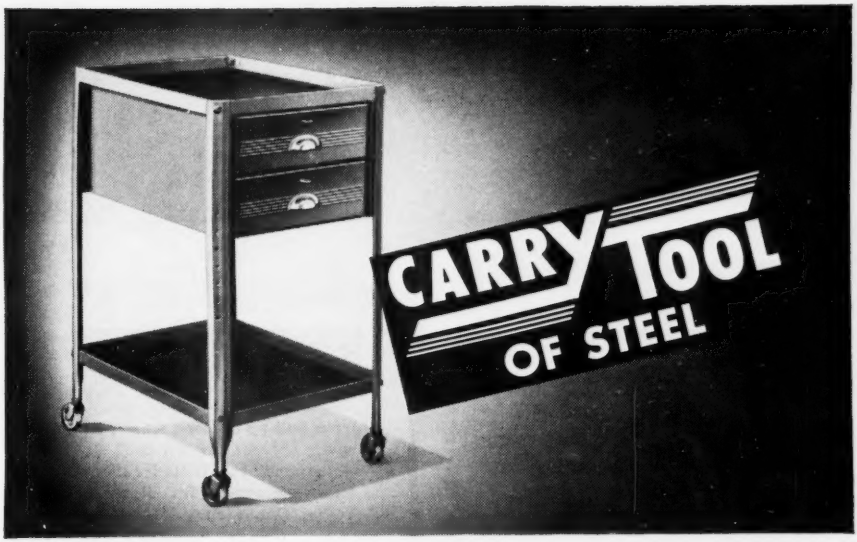

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Rotary Feed Table. The Bellows Co., 220 W. Market St., Akron, Ohio, has released an eight-page two-color bulletin on its rotary feed table. Designated as the T-25, the bulletin provides detailed information on how both the mechanically operated and the electrically operated models can be used for the fast feeding of parts to machine tools. Copy free.

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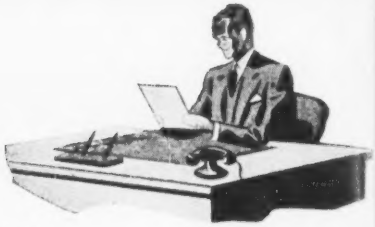

Numbers shown are page numbers in this issue

Abrasive Cloth, Paper, Discs, Belts, Stones, Etc., 31, 61, 64, 162, 163, 171
Absorbents, Oil and Grease, 280
Adapters, 278
Air Operated Equipment, (Look for specific item)
Angles, 203
Arbors, 267

Balancing Machines, 7, 118
Bar Feeds, Automatic, 20, 174, 309
Bar Machines, Automatic, 87, 88
Bar Stock, 135
Bearings, Ball, 153
Bearings, Roller, 153
Bearings, Sleeve, 113
Bearings, Thrust, 137, 153
Benches, Work, 179
Bench Legs, 179
Bending Devices, 130, 264, 317
Bending Machines, 165, 276
Bins, 179
Blades, Cutting-Off, 194
Blades, Insert, 124, 175, 197
Blocks, Step, 250
Blocks, V, 203
Bolts, 262
Boring and Facing Machines, Horizontal, 33
Boring and Turning Machines, Vertical, 25
Boring Bars, 145, 208, 261
Boring, Drilling and Tapping Machines, Horizontal, 55, 117
Boring, Drilling and Milling Machines, Multiple, 27, 33, 54
Boring Heads, Second Cover, 51, 172, 234, 263
Boring Machines, 55, 101
Boring Mills, Horizontal, 117
Boring Mills, Universal, 55
Boring Mills, Vertical, 25
Boxes, Shop, 179, 232, 287
Brakes, Press and Bending, 75, 86, 272, 317
Brazing Equipment, 284
Broaches, 257
Broaching Machines, 8, 9
Bronze Bars, 113, 137
Buffing Machines, 26, 285
Burners, Gas, 128
Bushings, Drill Jig, 204, 223, 229, 239, 292

Cabinets, 179
Calipers, Vernier, 246, 247
Cams, 109, 252
Carbides, 60, 124, 157, 197, 251, 286
Castings, Machine, 306
Centers, Lathe, Planer, Miller, Etc., 178, 251, 252, 256, 296
Chairs, 179
Chippers, Portable Pneumatic, 17, 42
Chisels, 186
Chucking and Indexing Fixtures, 164
Chucks, Air, 169
Chucks, Collet, 15
Chucks, Diaphragm, 193
Chucks, Drill, 15, 321
Chucks, Lathe, 18, 169, 185, 242
Chucks, Magnetic, 39, 58, 131, 185
Chucks, Tap, 321
Chucks, Universal, 185
Clamps, 186, 238, 275
Clamps, Air, 269
Cleaners, File, 186
Cleaners, Metal, 81
Clutches, 122, 149
Collars, Steel, 296
Comparators, 217
Compressors, Air and Gas, 42
Contact Wheels, 31
Coolants, Front Cover, 8, 9, 77, 81
Coolant Separators, 129
Cotter Pins, 294
Counterbores, 91, 147, 226, 249, 306
Countersinks, 301
Couplings, Air, 269
Couplings, Flexible, 122
Crayons, Marking, 106
Cut-Off Machines, 20, 140, 288, 309, 324
Cutter Bodies, Milling, 124
Cutters, Bar, Rod Etc., Hand, 317
Cutter Sharpening Machines, 8, 9, 123, 233
Cutters, Milling, 91, 97, 124, 147, 175, 250, 251
Cutters, Rotary, 263
Cutters, Washer, 186
Cylinders, Hydraulic and Pneumatic, 159, 269

Demagnetizers, 185
Desks, 179
Diamonds and Diamond Tools, 3, 259, 304, 307
Diamond Powder, 259
Die Casting Machines, 304
Die Feeds, 183
Die Heads, Threading, 2
Dieing Machines, 237
Die Lifting and Handling Machines, 245
Die Making Machines, 32, 84
Dies, 2, 4, 15, 86, 173, 278, 307, 313
Die Polishing Machines, 109
Die Sets, 215, 247
Dividing Heads, 51, 185, 196, 234
Dogs, Lathe, Grinder and Miller, 10, 68
Drafting Materials, 240
Dressing Fixtures, Grinding Wheel, 284

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Dressing Tools, 230, 259, 277
Drill Heads, 85, 98, 102, 190, 238, 321
Drilling Machines, Automatic, 302
Drilling Machines, Bench, 46, 47, 105, 121, 140, 209, 303
Drilling and Centering Machines, 115
Drilling Machines, Horizontal, 115
Drilling Machines, Multiple Spindle, 24, 46, 47, 67
Drilling Machines, Radial, 14, 24, 46, 47, 59, 79, 117, 303
Drilling Machines, Vertical, 14, 22, 29, 46, 47, 55, 67, 79, 109, 150, 201
Drills, Center, Core, Twist, Square, Etc., 91, 107, 147, 186, 197, 240, 251, 299
Drills, Portable Electric, 35, 42
Drills, Portable Pneumatic, 42
Drives, 278
Dust Control Equipment, 50, 319

Ejectors, Air Punch Press, 288
Engines, Diesel, 42
Engraving Machines, 207, 237
Etchers, 239

Fabricators, 16, 297
Facing Heads, 256
Feeders, Rotary Work, 150
Feed Units, 266, 288
Files, 103, 230, 297
Files, Band, 201, 258
Files, Rotary, 15, 297
Filing Machines, 84, 201, 258
Flame Hardening Apparatus, 8, 9
Flexible Shaft Equipment, 15, 133, 170, 209
Floats, 225
Forming Machines, 138
Furnaces, Heat-Treating, 177, 283

Gage Blocks, 30, 53
Gages, 30, 66, 125, 181, 193, 217, 232, 271
Gear Checking Instruments and Machines, 44, 45
Gear Cutting Machines, 44, 45, 233
Gear Finishing Machines, 44, 45
Gears and Gear Units, 5, 109, 252, 306
Gear Testing Machines, 44, 45
Generators, Thread, 44, 45
Grinders, Abrasive Belt, 231
Grinders, Air, 42, 221
Grinders, Bench, 26, 300
Grinders, Carbide Tool, 32, 139, 141
Grinders, Chip Breaker, 141
Grinders, Cutter and Tool, 19, 55, 311
Grinders, Disc, 26, 108
Grinders, Drill, 19, 32, 55, 120, 311
Grinders, Face, 108
Grinders, Face Mill, 32
Grinders, Flute, 123
Grinders, Pedestal, 26, 80
Grinders, Portable and Tool Post, 170, 209
Grinders, Portable Electric, 42
Grinders, Profile, 8, 9, 184
Grinders, Relief, 154
Grinders, Saw, 168
Grinders, Snagging, 26
Grinders, Surface, 19, 108, 143, 195, 234, 311
Grinders, Tap, 19, 123, 281
Grinding Fixtures and Attachments, 154
Grinding Wheels, 61, 64, 143, 162, 163
Guards, Gear, 297

Hammers, Portable Electric, 150
Hammers, Portable Pneumatic, 17, 42
Hammers, Lead, 226
Hand Tools, Power, (Look for specific item)
Hardening Compounds, 280
Hardness Testing Devices, 63, 148, 214
Hinges, 222, 292
Hobs, 91, 147
Hoisting and Conveying Machinery, 38
Holders, Tool, 10, 60, 68, 123, 194, 208, 210, 274
Hose, Air, 269
Honing Machines, 55
Hydraulic Equipment, (Look for specific item)

Indicators, 217, 271
Inspection Devices, 298

Jig Grinding Attachments, 43
Jig Borers, 14, 67, 297
Jigs and Fixtures, 29, 193
Joints, Universal, 278

Keys, Socket Screw, 236, 244, 294
Keyway Cutting Machines, 216, 231
Knives, Band, 271
Knobs, Machine, 250

Lathes, Automatic, 7, 23
Lathes, Bench, 121, 148, 273
Lathes, Engine and Toolroom, 25, 34, 46, 47, 55, 83, 121, 198, 273, 290, Third Cover
Lathes, Speed, 212
Lathes, Turret, 7, 121
Layout Materials, 250, 262
Lead Products, 226
Lifters, 245
Lighting Equipment, 200
Light Wave Measuring Equipment, 30
Lubricants, 81
Lubricating Systems, 160
Lubricators, 160

Mandrels, Expanding, 225, 282
Markers, 204
Marking Machines, 62, 219, 253
Masks, Dust, 292
Micrometers, 30, 53, 271, 286
Milling Machine Attachments, 51, 109, 142, 267
Milling Machines, Bench, 148, 199, 284
Milling Machines, Horizontal, 8, 9, 12, 13, 55, 273
Milling Machines, Profile, 207, 237
Milling Machines, Vertical, 11, 207, 237, 273
Mills, End, 91, 107, 147, 180, 188
Mills, Face, 197
Mills, Hollow, 197
Molds, Lead, 226
Motors, 151, 300
Mounted Points and Wheels, 61

Nails, Special, 213
Nibblers, 220, 258

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Notchers, 152, 317
Numbering Machines, 62, 253
Nuts, 250

Oils, Cutting, 81

Packings, 81
Pantographs, 207, 237
Parallels, 203
Parts, Machine, Aircraft, Production, Etc., 16, 236, 278, 294
Patterns, 306
Penetrators, 214
Pinion Cutting Machines, 233
Pins, 236, 244, 294
Planer-Millers, 101
Planers, 34, 55, 101
Plates, Angle, 203
Plates, Surface, 203, 232
Polishing Machines, 26, 285
Polishing Wheels, 52, 64
Presses, Arbor, 140, 225
Presses, Foot, 140
Presses, Hydraulic, 89
Presses, Power, 138, 173
Presses, Punch, 28, 48, 49, 146, 199, 258, 291, 295
Presses, Sub, 233
Pumps, Coolant and Lubricant, 41, 323
Pumps, Hydraulic, 41
Pumps, Vacuum, 42
Punches, 173, 278, 313, 317
Punch Press Feeds, 258, 288
Punch Press Sets, 250

Racks, Bar and Tube, 122, 179
Racks, Machine, 244, 294
Reamers, 91, 116, 143, 147, 249, 251, 294, 306
Reels, Stock, 138, 288
Riveting Machines, 104, 220
Rivets, 213
Roll Feeds, 237
Rules, Measuring, 265, 271
Rust Preventives, 81

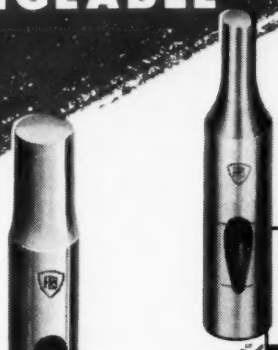
Safety Equipment, Press, 224
Salts, Heat Treating, 81
Sanders, Portable Electric, 171
Sanding Machines, 201
Saw Blades, Band, 68, 106, 205, 235, 271
Saw Blades, Circular, 211
Saw Blades, Hack, 68, 106, 187, 205, 235, 271, 272
Saw Blades, Slotting and Slitting, 211
Saw Frames, Hack, 106
Sawing Machines, Band, 68, 119, 140, 174, 189, 201, 233, 258
Sawing Machines, Circular, 20, 55, 201
Sawing Machines, Hack, 40, 68, 176, 185, 309
Saw Sharpening Machines, 168, 182
Scalers, Portable Pneumatic, 42
Scrapers, Hand and Power, 118
Screw Drivers, Portable Electric, 42
Screw Drivers, Portable Pneumatic, 42
Screw Driving Machines, Power, 132
Screw Machines, 252
Screw Machines, Automatic, 54
Screws, Cap, Set, Socket and Machine, 213, 250, 260, 262, 289, 296, Fourth Cover
Screws, Transfer, 259
Services: Milling, Grinding, Lapping, Rebuilding, Repairing, Business, Etc., 16, 36, 37, 246, 268, 286, 301, 306, 307
Shaper-Planers, 34
Shapers, 34, 65, 75, 83, 121, 161, 273
Sharpening Fixtures, 180
Shearing Machines, 75, 140, 317
Shears, 152
Shears, Portable, 238
Slotting Machines, 34, 55, 252
Soldering Irons and Tips, 244
Soldering Materials, 158
Spacers, 109, 242
Special Machinery, 7, 55, 233
Speed Reducers, 192
Spindles, Grinding, 57, 99
Spot Facers, 226
Spring Winders, 241, 242
Sprockets, 255
Staking Machines, 104
Stampings, Pressed Metal, 307
Stamps, 204, 219, 241, 253, 274
Steel, General Purpose, 135
Steel Stock, Ground Flat ,271
Step Block Sets, 250
Stools, 179
Strainers, 293
Straightening Machines, 118, 288
Studs, 262
Stud Sets, 250
Superfinishing Machines, 7
Swaging Machines, 109, 168

T-Nut and Stud Sets, 250
Tables, Elevating, 105
Tables, Rotary and Index, 11, 51, 114, 240, 252, 267, 278,
Tapes, Measuring, 265, 271
Tap Extractors, 254
Taper Attachments, 256
Tappers, Hand, 227
Tapping Attachments, 15, 134, 238, 260, 279, 321
Tapping Machines, 29, 105, 321
Taps, 6, 15, 90, 143, 147
Threading Machines, 29, 123, 233
Thread Rollers, 109
Tool Bits, 188, 208, 274
Tool Blanks, 157
Tools, Boring, 60, 197, 282
Tools, Bottoming, 60, 282
Tools, Facing, 60, 172, 282
Tools, Form, 97, 251
Tools, Gear Cutting, 44, 45
Tools, Internal Threading, 60
Tools, Planishing, 254
Tools, Shaving, 44, 45
Tools, Special Cutting, 91, 147, 157, 197, 251
Tools, Threading, 97
Traps, Air and Steam, 225

Valves, 155, 225, 269
Vises, Bench and Machine, 109, 122, 131, 169, 185, 186, 224, 227, 236, 252, 277

Welding Equipment and Supplies, 243
Wheelheads, Second Cover
Wire Working Machines, 138
Work Feeders, 150
Wrenches, 186, 191
Wrenches, Portable Pneumatic, 42

INTERCHANGEABLE PUNCHES and DIES



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GUEST EDITORIAL

The Welfare State Riddle

"YES," said the Oxford-educated, roving Ambassador from Pakinesia, "I have been sent to the United States for the specific purpose of finding out how to bring prosperity to our 'underprivileged'—a class all too numerous in our country. I understand that your Congressional Joint Committee on the Economic Report has just investigated this problem. Therefore, I have come to you, Dr. Wiserling, chief economist of your great American Government, to get the pertinent information."

"Well," said Dr. Wiserling, "while our nation is generally prosperous, it is still true that about one-fourth of our family units (counting as a family any single person who supports him- or herself) have annual incomes below $2,000, and we assume that most such families are ill-clothed, ill-housed, and ill-fed."

"Pardon me," said the Ambassador. "Did you say two *hundred* or two *thousand* dollars? Only a few of our wealthy families have incomes as high as $2,000. But how can anyone be ill-fed in America? I have heard so much of your marvelous transportation system, your tremendous reclamation projects, and your research programs which have revolutionized farming. In fact, I've been especially instructed to request Point Four assistance in bringing my country's backward transportation and agriculture up to date."

"It is true," answered Dr. Wiserling, "that we have highly efficient railroads, but, as it happens, the railway employees belong to unions which insist on very high wages and very little work. This keeps railway freight and passenger rates relatively high. Reclamation projects, use of more fertilizer, finer machinery, and advanced scientific methods have tended to flood our markets with farm products, and thus make these products very cheap. Hence, to protect our farmers against low prices, our Government has been forced to buy huge quantities of farm products. At present, in fact, Government warehouses contain more than $3,500,000,000 worth of such surplus produce."

"Then, it will give most of these stored foodstuffs to your 'underprivileged'?" asked the Ambassador.

"Certainly not," replied the Government economist. "Do you not realize that such gifts would destroy demand and break the market?"

"I see," said the Ambassador, "but I have heard much about your wonderful hybrid corn which yields so marvelously. Cannot the needy people live on that?"

"Americans eat but little of the corn," explained Dr. Wiserling. "Most of it is fed to hogs and poultry and cows and steers."

"Oh, I see," said the Ambassador. "That furnishes cheap pork and eggs and milk and butter and beef for the poverty-stricken."

"Well, not exactly," replied economist Wiserling. "As I said before, our Government maintains price supports in order to protect the farmers, and these price supports keep the prices of pork and eggs and milk and butter and beef high. So the poor can buy only limited quantities of such foods."

"So, like the masses in northern Europe, they must live mostly on potatoes?" inquired the Ambassador.

"Not at all," responded Dr. Wiserling. "Price supports on potatoes make them expensive too. Our Government buys the best potatoes, and converts them into very costly potato flour. It is given to our hungry socialist friends overseas."

"I'm puzzled by the fact that, with surplus food to give away, one-fourth of your families are ill-fed," said the Ambassador. "Besides, practically all of the people I see on the street look well nourished. Just where do these 'underprivileged' Americans live?"

"They are scattered through the nation," replied Dr. Wiserling, "but their greatest concentration is in the South. Workers on the cotton and peanut plantations are the poorest, and hence are most in need of help."

"But," continued the Ambassador, "I read in one of your newspapers this morning that your Secretary of Agriculture is requiring your growers of cotton and peanuts to reduce sharply the acreage to be planted to these crops, and that such curtailment will throw out of employment many thousands of those who normally work on these plantations. Is this helping these 'underprivileged'? What will they do now?"

"Why, I suppose," replied Dr. Wiserling, "they can go to work in factories."

"But," persisted the Ambassador, "it seems to me that, with less cotton grown, fewer workers will be needed in the cotton mills. And furthermore, I understand that your coal miners are out on strike, and are thus forcing factories of various kinds to close for lack of coal. Will this make it easy for the unemployed cotton- and peanut-farm hands to get new jobs?"

"Oh well," retorted Dr. Wiserling, "they can get unemployment compensation, and that will sustain demand and make more jobs."

"Just how?" inquired the Ambassador. "Won't the demand of the taxpayers shrink by exactly as much as the demand of the unemployed expands?"

"Oh hang the taxpayers, they're always making a fuss about something," groaned Dr. Wiserling.

"I'm sorry," sighed the Ambassador. "I just can't understand your 'welfare state.' I would think that, to help the 'underprivileged,' you would need to produce more and make things cheap—but, instead, you strive to produce less and make things dear."

"You forget Keynes' teachings," interrupted the Fair Deal economist. "Just use his multiplier with a minus sign. Simplicity itself!"

"But I'm still puzzled," insisted the Ambassador. "You have billions of dollars to give away, but you still tell me that one-fourth of your families are ill-housed, ill-clothed, and ill-fed. Yet everyone looks prosperous and rides in an automobile. I don't believe that we Orientals can ever understand your American ways. I'm afraid Point Four is four points beyond me! It's all a strange riddle. I'll sleep on it. Maybe the solution will come to me in my dreams. I certainly can't solve it when awake!

"When does the next plane leave for Pakinesia?"

—WILLFORD I. KING.

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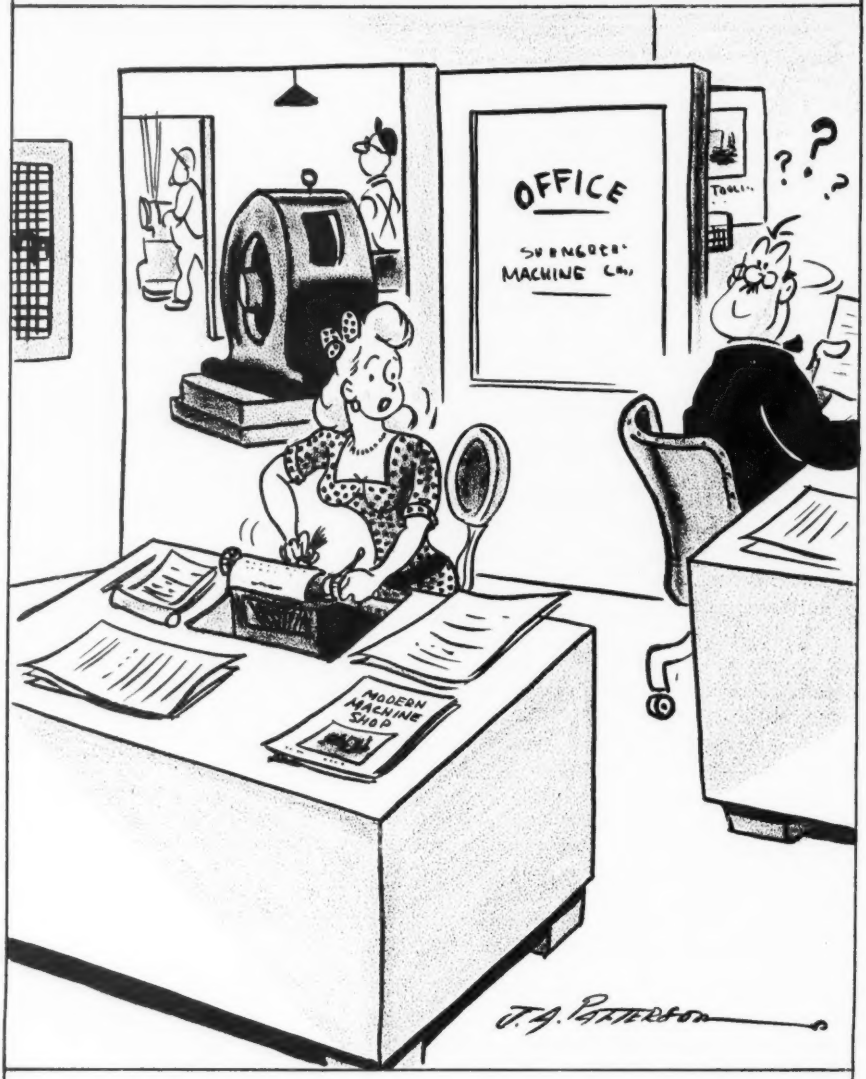

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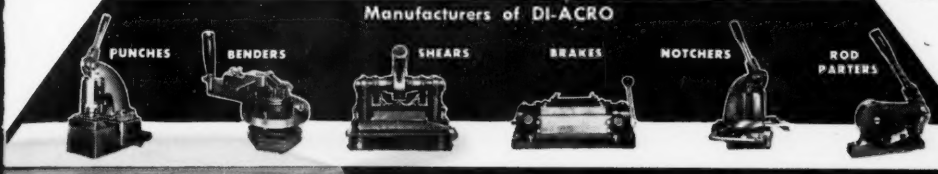
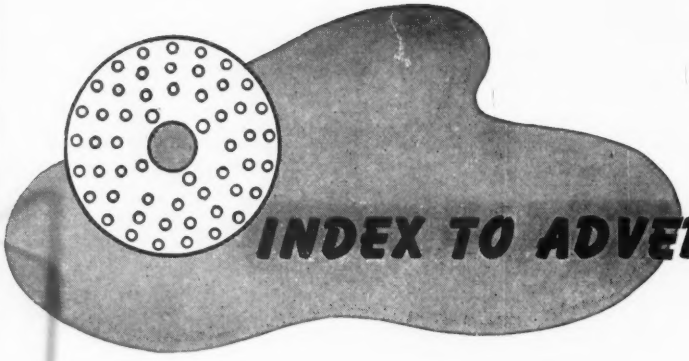




INDEX TO ADVERTISEMENTS

A

Abart Gear & Machine Co. 192
Ace Tool & Die Works 291
Acme Industrial Co. 223
Acme Tool Co. 210
Acro Metal Stamping Co. 160
Acromark Co. 219
Advance Machine Works 238
Albertson & Co. Inc. 171
Allied Products Corp. 313
American Air Filter Co. 319
American Pipe Bending Machine Co. 276
American Society of Tool Engineers 36, 37, 301, 304
American Steel Foundries, King Machine Tool Div. 25
American Swiss File & Tool Co. 297
Ames Co., B. C. 217
Ames Precision Machine Works 148
Anderson Bros. Mfg. Co. 118
Armstrong-Blum Mfg. Co. 68
Armstrong Bros. Tool Co. 10
Atlantic Gear Works 252
Atlas Press Co. 65
Auto Engraver Co., Inc. 237
Auto Moulding & Mfg. Co. 292
Auto-Tool & Engr. Co. 302
Avey Drilling Machine Co. 114

B

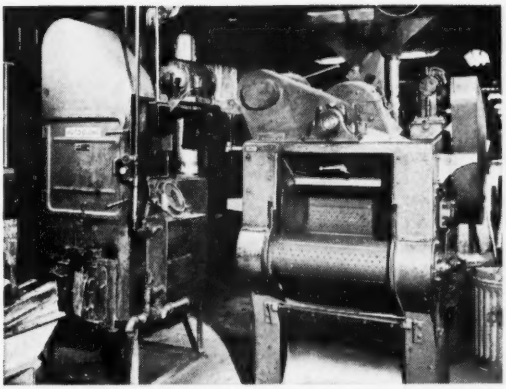
Baldor Electric Co. 300
Barber-Colman Co. 97
Barnes Drill Co. 129
Baumbach Mfg. Co., E. A. 247
Bay Metal Products Co. 232
Bay State Abrasive Products Co. 61
Beckett-Harcum Co. 266
Behr-Manning, Div. of Norton Co. 31
Behr Products Co. 282
Benchmaster Mfg. Co. 199
Besly & Co., Charles H. 143
Bicknell-Thomas Co. 226
Billings & Spencer Co. 191
Black Diamond Saw & Machine Works, Inc. 120
Blake Co., Edward 123
Bloomfield Tool Corp. 252
Boggis & Co., H. P. 281
Boice-Crane, Inc. 201
Bokum Tool Co. 60
Bradford Machine Tool Co. 285
Bremil Mfg. Co. 238
Brewster-Squires Co. 239
Brighton Screw & Mfg. Co. 289
Brown Engr. Co. 122
Brown & Sharpe Mfg. Co. 41, 53
Bryant Mchry. & Engr. Co. 67
Bryant Products, Jerry 292
Buckeye Brass & Mfg. Co. 137
Buffalo Dental Mfg. Co. 284
Buffalo Forge Co. 22
Bullard Co. 33

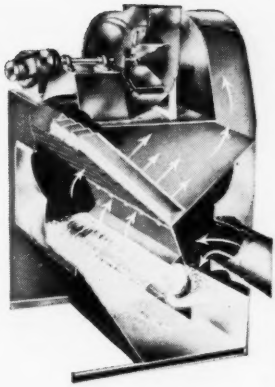
C

Carson-Newton Co. 230
Challenge Mchry. Co. 203
Chandler Tool Co. 172
Chicago Pnuematic Tool Co. 42
Chicago Tool & Engr. Co. 278
Cimcool Div., Cincinnati Milling Machine Co. ....First Cover
Cincinnati Bickford Tool Co. 79
Cincinnati Electrical Tool Co. 324
Cincinnati Gilbert Machine Tool Co. 117
Cincinnati Lathe & Tool Co. 46, 47
Cincinnati Milling Machine Co. 8, 9
Cincinnati Shaper Co. 75
Cincinnati Tool Co. 186
Circular Tool Co., Inc. 211
Clark Instrument, Inc. 214
Clausing Mfg. Co. 198
Cleveland Industrial Tool Corp. 3
Cleveland Punch & Shear Works Co. 173
Cleveland Twist Drill Co. 107
Clipper Diamond Tool Co., Inc. 259
Colonial Bushings, Inc. 239
Commander Mfg. Co. 102, 134
Commercial Centerless Grinding Co. 246
Consolidated Machine Tool Corp. 55
Continental Machine Co. 288
Cook, Inc., Lawrence H. 226
Cooley Electric Mfg. Corp. 283
Covel Mfg. Co. 311
Cross & Co., Herbert 256
Cunningham Co., M. E. 241
Cuno Engr. Corp. 293
Custom Scientific Instrument Co. 298

D

Danly Machine Specialties, Inc. 215
Davis Keyseater Co. 231
Delco Products Div., General Motors Corp. 151
Desmond-Stephan Mfg. Co. 277
Detroit Boring Bar Co. 261
Detroit Power Screwdriver Co. 132
Detroit Stamping Co. 275





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DUST CONTROL EQUIPMENT

Di Machine Corp., ...146
Dickerman Mfg. Co., H. E. 183
Die Casting Machine Tool Corp. 304
Dreis & Krump Mfg. Co. 86
du Mont Corp. 257
Dumore Co. 209
Dykem Co. 262

E

Economy Engr. Co. 245
Economy Machine Products Co. 260
Economy Tool & Machine Co. 204
Ellwood Products Co. 242
Errington Mechanical Laboratory, Inc. 260
Ettco Tool Co., Inc. 321
Everede Tool Co. 274
Ex-Cell-O Corp. 57

F

Falls Products, Inc. 296
Famco Machine Co. 140
Farrel-Birmingham Co., Inc. 5
Fellows Gear Shaper Co. 44, 45
Flynn Mfg. Co. 234
Foote-Burt Co. 59
Ford Mfg. Co., M. A. 263
Foredom Electric Co. 133
Fosdick Machine Tool Co. 14
Fuller Tool Co. 249
Fulmer Co., C. Allen 56

G

Gairing Tool Co. 124
Gallmeyer & Livingston Co. 19
Gammons-Hoaglund Co. 294
Gateo Rotary Bushing Co. 292
General Engr. & Mfg. Co. 161
Gillen Co., John 236
Gilmore & Co., F. F. 304
Gisholt Machine Co. 7
Globe Products Mfg. Co. 208
Graham & Co., Inc., John H. 205
Grant Mfg. & Machine Co. 220
Gray Co., G. A. 101
Gray Machine Co. 258
Greenlee Bros. & Co. 54
Griffin Co., G. W. 205
Grob Brothers 258
Grobet File Co. of America 301

H

Hamberger Machine Co. 182
Hamilton Tool Co. 105
Hammond Mchry. Builders, Inc. 141
Hanchett Magna-Lock Corp. 131
Hanchett Mfg. Co., Saw & Knife Fitting Machine Div. 230
Hanson-Whitney Machine Co. 6
Hartford Special Mchry. Co. 109
Harvey Mfg. Corp. 84
Hassall, Inc., John 213
Heald Machine Co. ....Second Cover
Heimann Mfg. Co. 259
Herman Stone Co. 222
Hevi Duty Electric Co. 177
High Speed Hammer Co., Inc. 104
Hisey-Wolf Machine Co., Div. of Cincinnati Electrical Tool Co. 26
Hjorth Lathe & Tool Co. 242
Holo-Krome Screw Corp. ....Fourth Cover
Horberg Gage Co. 125
Horton & Son Co., E. 18
Hossfeld Mfg. Co. 130
Houghton & Co., E. F. 81
Houston Grinding & Mfg. Co., Inc. 178

I

Ingersoll Milling Machine Co. 175

J

Jarvis Co., Charles L. 15
Johnson Bronze Co. 113

K

Kasenit Co. 280
Kearney & Trecker Corp. 12, 13
Kempsmith Machine Co. 267
Kennametal, Inc. 157
Kester Solder Co. 158
Kindt-Collins Co. 184
King Machine Tool Div., American Steel Foundries 25
Knight Mchry. Co., W. B. 11

L

L-W Chuck Co. 185
Landis Machine Co. 2
LeBlond Machine Tool Co., R. K. ..Third Cover
LeCount Tool Works, W. G. 282
Lewthwaite Machine Co., T. H. 278
Lindberg Engr. Co. 159
Linley Bros. Co. 297
Lipe-Rollway Corp. 40
Littell Machine Co., F. J. 288
Littleford Bros., Inc. 297
Logan Engr. Co. 83
Luers, J. Milton 194
Lufkin Rule Co. 265
Lukens Steel Co. 16
Luma Electric Equipment Co. 244
Lyon Metal Products Co. 179

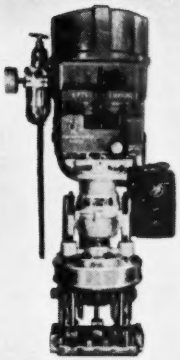
M

Madison-Kipp Corp. 221
Madison Mfg. Co. 145
Manhattan Rubber Div. 52
Martin Machine Works, J. E. 224
Marvin Machine Products, Inc. 51
Master-Taper Co. 256
Mattison Machine Works 108
Maxwell Co. 263
Mead Specialties Co. 150
Michigan Chrome & Chemical Co. 250
Michigan Drill Head Co. 190
Miller-Knuth Mfg. Co. 176
Millers Falls Co. 35
Montgomery & Co., Inc. 241
Morris Machine Tool Co. 24
Motch & Merryweather Mchry. Co. 20
Mummert-Dixon Co. 256

N

National Acme Co. 87, 88
National Automatic Tool Co. 27
National Machine Tool Co. 236
National Twist Drill & Tool Co. 91
Nebel Machine Tool Co. 290
New Hermes, Inc. 207
New Method Steel Stamps, Inc. 204
Niagara Machine & Tool Works 48, 49
Nichols-Morris Corp. 196
Nicholson & Co., W. H. 225
Nicholson File Co. 103
Nilson Machine Co., A. H. 138
Noble & Westbrook Mfg. Co. 62
Norma-Hoffmann Bearings Corp. 153
North Bros. Mfg. Co. 227
Northwestern Tool & Engr. Co. 250
Norton Co. 162, 163
Numberall Stamp & Tool Co. 253

TAPPING MACHINES



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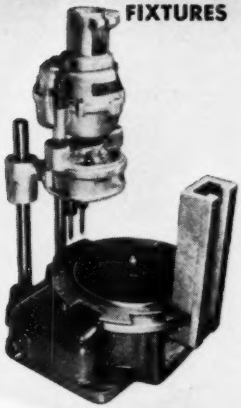

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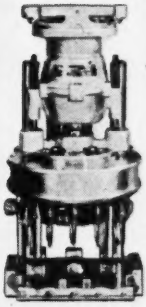
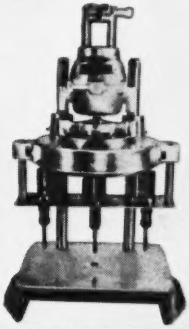


FIXED SPINDLE



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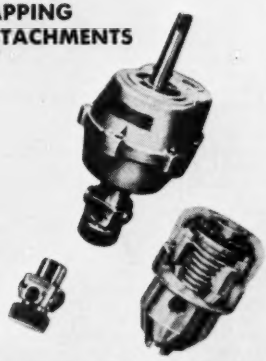

DRILL & TAP CHUCKS

O

OK Tool Co., Div. Williams & Hussey Machine Co., Inc. 268
Oliver Instrument Co., Inc. 32
Oliver Mchry. Co. 233
O'Neil-Irwin Mfg. Co. 317
Ottemiller Co., Wm. H. 262

P

PTI Inc. 247
Pedrick Tool & Machine Co. 165
Pittsburgh Stamp Co., Inc. 274
Pope Mchry. Corp. 99
Precise Products Co. 170
Procunier Safety Chuck Co. 279
Prosser & Son, Thomas 139

Q

Quality Tool Works 250
Queen City Machine Tool Co. 80

R

Racine Tool & Machine Co. 309
Raybestos-Manhattan, Inc. 52
Reading Machine Co. 216
Reid Bros. Co., Inc. 234
Republic Gage Co. 66
Republic Steel Corp., Union Drawn Div. 135
Rimat Machine Tool Co. 286
Roberts Rubber Co., Weldon 64
Rockford Clutch Div., Borg-Warner Corp. 149
Rockford Machine Tool Co. 34
Roll Feeds Corp. 237
Ross Operating Valve Co. 155
Rotor Tool Co. 17
Royal Oak Tool & Machine Co. 154
Rusnok Tool Works 142
Ruthman Mchry. Co. 323
Rutland Tool Service 286

S

S & S Hinge & Metal Products Co. 222
Sales Service Machine Tool Co. 21
Sanford Mfg. Co. 195
Savage Co., W. J. 220
Schauer Mfg. Corp. 212
Scherr Co., Inc., George 246
Schrader's Son, A. 269
Searjeant Metal Products, Inc. 224
Seibert & Sons, Inc. 278
Seneca Falls Machine Co. 23
Service Machine Co. 295
Services Directory 306, 307
Sewall Mfg. Co., E. B. 255
Sheldon Machine Co., Inc. 273
Simonds Saw & Steel Co. 187
Skinner Chuck Co. 169
Smith & Sons, George W. 243
Snow Mfg. Co. 29
Somerset Tool Co. 284
South Bend Lathe Works 121
Speedgrip Chuck, Inc. 242
Spra-Con Co. 38
Standard Horse Nail Corp. 294
Standard Pressed Steel Co. 296, 305
Standard Steel Specialty Co. 244
Standard Tool Co. 147
Staples Tool Co. 251
Starrett Co., The L. S. 271
Sterling Factory Equipment Co. 287
Stevens Inc., John B. 252
Sun Oil Co. 77
Sundstrand Machine Tool Co. 115
Sundstrand Magnetic Products Co. 39
Super Tool Co. 197
Surface Combustion Corp., Heat Treat Div. 128

T

Taft-Peirce Mfg. Co. 181
Tamms Industries, Inc. 280
Tannewitz Works 189
Teeter, C. B. 254
Thompson & Son Co., Henry G. 235
Thriftmaster Products Corp. 238
Tietzmann Tool Corp. 232
Torit Mfg. Co. 50
Troyke Mfg. Co. 234, 240
Twentieth Century Mfg. Co. 116

U

United States Burke Machine Tool Co. 284
United States Drill Head Co. 98
Universal Engr. Co. 229

V

V & O Press Co. 258
Van Keuren Co. 30
Verson Allsteel Press Co., Inc. 272
Victor Mchry. Exchange, Inc. 299
Victor Saw Works, Inc. 106
Vimco Mfg. Co. 260
Vinco Corp. 164
Vogel Tool & Die Corp. 152
Vulcan Tool Co. 43

W

Wade Instrument Co. 240
Walker Co., Inc., O. S. 58
Walker-Turner Div., Kearney & Trecker Corp. 119
Walls Sales Corp. 231
Waltham Machine Works 233
Walton Co. 254
Wardwell Mfg. Co. 168
Watts Bros. Tool Works 240
Weldon Tool Co. 180
Wells Mfg. Corp. 174
Whistler & Sons, Inc., S. B. 4
Whitney Metal Tool Co. 264
Wiedemann Machine Co. 28
Wilson, K. R. 89
Wilson Mechanical Instrument Co. 63
Winter Bros. Co. 90
Wisconsin Drill Head Co. 85
Woodson Tool Co., Inc. 188
Woodworth Co., N. A. 193

Z

Zewo Mfg. Works, Inc. 303

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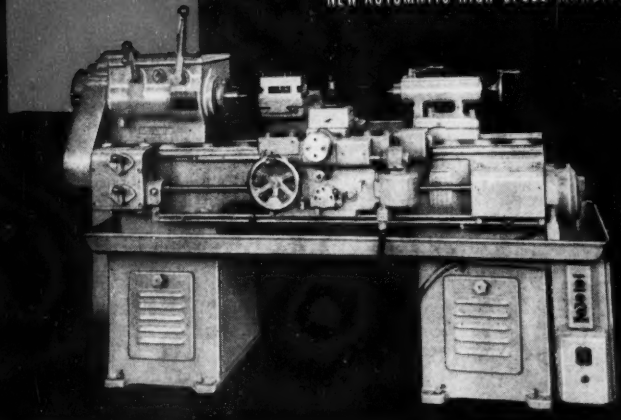

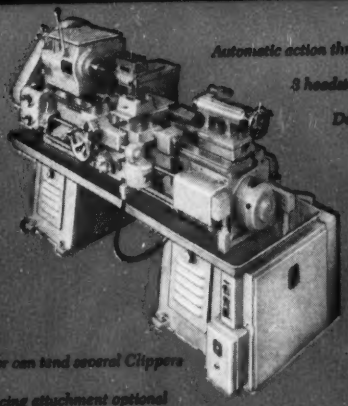

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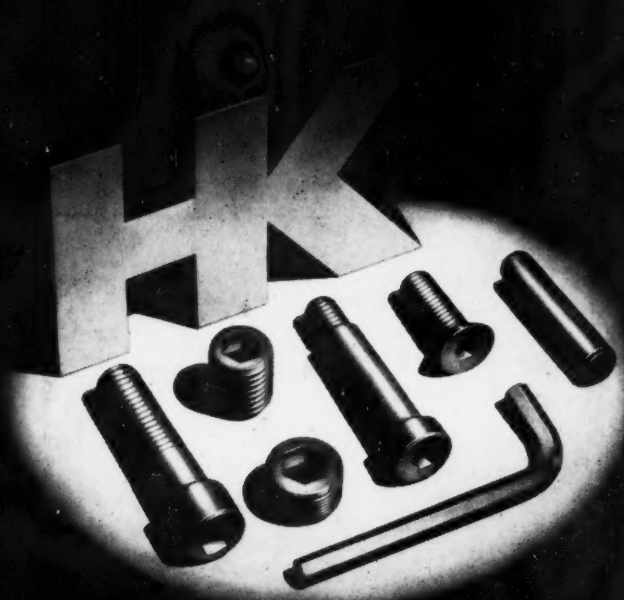

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